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The Waring Air Compressor.

ONE of the most noticeable objects in the machinery department of the American Institute Fair, is an extremely neat looking machine which has an oscillating cylinder, poised high in air, and operating a system of fly wheels and cranks which move a piston playing in a horizontal cylinder. This machine, which from its imposing and peculiarly *clean* make attracts a great deal of attention, is a new Air Compressor invented by Mr. J. B. WARING and made by the Rand and Waring Drill and Compressor Co., 21 Park Row. This firm have adopted the principle of cooling the compressed air by a stream of water running in a jacket around the air cylinder. The high heat developed by the compression of air, greatly increases the pressure against the piston while the tension due to this temperature is dissipated as the air cools down in the pipes or receiver. Thus the heat increases the work put upon the machine, or lessens the amount of work stored up at the point of application.

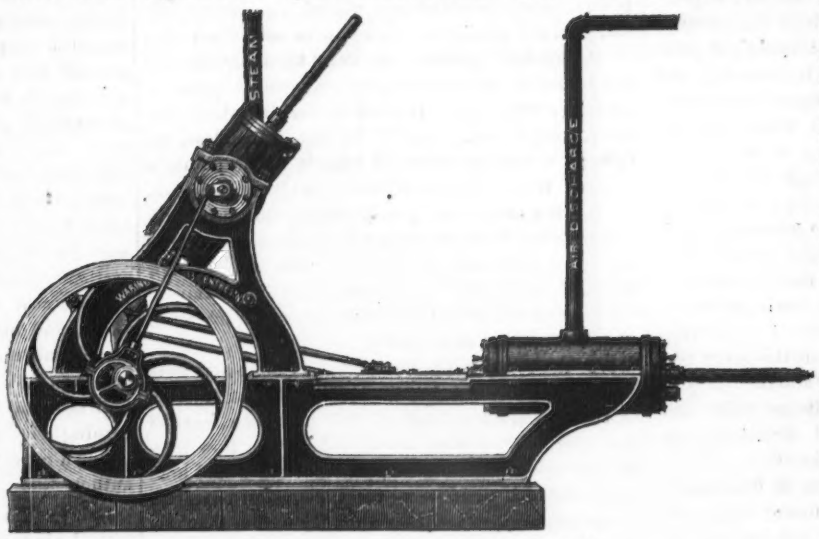
The heat developed in compressing air to 4 atmospheres is sufficient to expand it about 90 per cent. Four cubic feet of air, if reduced to the point where 4 atmospheres pressure is exerted, will fill a space not of 1 cubic foot but of 1·9 cubic feet. If this is suffered to cool in the pipes the tension due to temperature will pass away and the air will be at only a little more than 2 atmospheres pressure; while if the compression is carried far enough to ensure a pressure of 4 atmospheres after the air has cooled down, the work required of the machine is increased. The particular advantage of Mr. WARING'S design is that the heat is abstracted in the very moment of its development, so that the machine does no work which is not stored up *in toto*.

The cooling of the air also has the best effect upon the temperature of the mine and the health of the workmen. It undoubtedly contributed very materially to the rapid work at Mont Cenis, and in many mines would be an invaluable boon.

The machine which we illustrate is calculated for 35 horse power, and occupies a space of 17×6 feet in the base, and 9 feet high. The indirect gearing gives marked advantages, as the pistons of the steam and air cylinders bear such a relation to each other that live steam is admitted behind the former just as the latter is nearing the end of its stroke and is subjected to its greatest work. In the commencement of the stroke of the air piston, when its work is light, steam is working expansively. There is in this arrangement something more than the mere certainty of the compressor performing its work. There is a real gain in power required, and the machine undoubtedly works up to the maximum economy possible.

The circulation of water is peculiarly managed. It first flows around the body of the compressing cylinder which is of brass, and then cools an outer cylinder where the hygroscopic moisture of the compressed air is condensed, and from which it flows off by a trap. After circulating through one cylinder head and the two cylinders it arrives at the rear cylinder head. That has a tube in which the piston rod moves as in a closed box. Within this is a return tube small enough to fit within the piston rod which is hollow, and this tube runs through the cylinder as far as the front cylinder head. Thus the piston rod plays within one tube and around another. The water flows through its entire length, and into the piston as well. Thus there is no part of the machine with which the heated air comes in contact, that is not cooled by the stream of water. In addition to this, a very thin film of the fluid spreads itself over the inner cylinder surface, and both lubricates the parts and aids most effectively in cooling the air.

The design of the machine is evidently good. The regular work required in air compressing permits the use of a fly wheel and the most economic disposition of the parts. We were struck with the absence of all effort to secure the compactness which is so often presented as a claim to attention, in spite of its sometimes injurious effect. A compressor is—so far as the interior of a mine is concerned an out of doors machine, and it is stability, economy and efficiency that are to be studied and not a band-box compactness. Mr. WARING has devised a machine that will be noticeable not only at fairs but amid any works.



THE WARING AIR COMPRESSOR.

In looking back over the history of air compressing it is impossible to ignore the advance made in cheapness, and no doubt, in efficiency as well, of the machines used. The machines that drove the great tunnel of Mont Cenis cost from $12,000 to $14,000 each, including the water wheels which moved them. The Moresnet machines cost $6,500, and one in the Saarbruck district cost about $14,000. But other machines have been made, of less power naturally, for $1,500 to $2,500. One is put down at $400, but that is in Sweden and prices there don't count in other countries. It is interesting to read the statistics of compressed air given by M. PERNOLET, the well-known French Engineer. A cubic yard cost at:

Moresnet	0·133	cents at	2 atmospheres.
Albert Shaft	0·220	"	5 "
Gegen Ort Shaft	0·368	"	4 "

M. PERNOLET considers the last a good basis for calculating estimates. In this country the special machines designed and used abroad are not in use. Patented constructions have taken the field so completely that it is doubtful if special designs are ever made, unless for some great and lasting work, and the chances are all in favor of machines like Mr. WARING'S. In proof of this we will mention the fact that HENRY MEIGS, the "Railroad King" of South America, has just ordered *nine* WARING compressors to work in a tunnel which is to be cut through the Andes for the purpose of connecting the headwaters of the Amazon with the Pacific. The machines weigh 7 tons each, but for convenience in transportation they are made in sections which, when boxed, will not weigh more than 300 pounds each. Including the pumps and extras the order amounts to about $60,000, which is said to be the largest ever given for machinery of this kind. It was given only after a thorough inspection by Mr. MEIGS' engineers.

Two other WARING compressors are building for the Saint Clair (Pa.) shaft which is now down 300 feet and on its second stage.

Effects of Slow Action.

Dr. BECQUEREL gives in the *Comptes Rendus* an account of the results of some experiments which prove that, by slow but continued action, curious interchanges of salts may be obtained; for instance—Crystals of arragonite are formed upon a piece of gypsum (lance-shaped variety) kept in a closed vessel in a solution of bicarbonate of potassa; the gypsum has almost entirely disappeared, having become converted into arragonite. A similar piece of gypsum, placed in a solution of arseniate of ammonia, has been converted into arseniate of lime. With a solution of aluminate of potassa and gypsum, the result is the formation of glauberite (double sulphate of lime and potassa, the latter substituted for the soda in the mineral just named). Pieces of galena, kept for twenty years in a solution of bicarbonate of potassa, have yielded well-defined crystallised carbonate of lead. When pieces of limestone were immersed into a solution of plombite of potassa (solution of oxide of lead in caustic potassa), the result was the formation of beautifully-crystallised hydrated carbonate of lead; malachite has been obtained by the action of limestone upon nitrate of copper, converting it into subnitrate, which, in its turn, is converted into malachite by bicarbonate of soda.

Excellent deposits of coal have just been found in Turkistan, Asia, near the Yusuf Pass, and three hundred camel loads of the fuel have recently been delivered at Kabul for use in the Ameer's foundries.

American Institute of Mining Engineers.

Pittsburgh Meeting.

The sixth regular meeting of the American Institute of Mining Engineers commenced its session at the Hall of the Western University, on Wednesday evening, October 16th, 1872. At eight o'clock, the President called the meeting to order, and introduced JAMES PARKE, JR., of Pittsburgh, who delivered the following address of welcome:

ADDRESS OF JAMES PARKE, JR.

On behalf of Pittsburgh and the manifold industries which center in it, my pleasant duty this evening is to extend to each and all of you, gentlemen of the American Institute of Mining Engineers, a cordial welcome. The welcome I tender you on behalf of the citizens of my native place, is earnest and sincere. There is, perhaps, no other city on this continent, whose prosperity and growth is more intimately allied with the development of the mining interests than Pittsburgh. Its annual products, now counted by millions, are, in great part, due to the wealth taken from the bowels of the earth, and the employment which it sustains reaches to its furthest borders. Our people are engaged in the midst of clouds of smoke and flashes of flame which come rushing forth from many furnaces, and deafened by the beating of hammers and noise of engines and machinery, and clashing of great plates, sheets and bars of glowing iron, steel and copper, as they fall on the floors of our mills and forges. Begrimed, as you will find them with smoke, and wet with the sweat of honest toil, with emotions as true as they are tender, they will, as they open the white hot furnace doors, give you a warm, hearty and generous welcome to their places of industry. On behalf of our toiling thousands, I invite you to visit them, believing you will meet with much that will impress your minds with the busy scenes which the interiors of our many manufacturing establishments will print upon your memories. It is through your skill and energy that mines are opened and successfully worked to supply fuel to feed the flames which generate heat, which keeps all our machinery in active motion. When you have looked through the interior of our workshops, I invite you to take an outside view, over all. You can be taken to prominent eminences, from which you can, at night, witness panoramas not surpassed by any to be found elsewhere. Looking from these points, up and down our rivers, you can, at a glance, see the volume of smoke and lurid glare of flame, which points out the many furnaces, whilst the rattle of machinery and the timkling sounds of the hammers from the distant mills and forges, come to your ears from all directions, one sound chiming harmoniously with the others. These are the daily and nightly utterances of Pittsburgh, set to music by the science of the mining engineer, whose skill and ingenuity develops the fuel and directs the working of the mines from which the fuel is taken to give motion to this gigantic music box. Wearied by the fatigue of travel, and of your pursuits, I hope these scenes accompanied by Pittsburgh music, will excite emotions which will bring vividly to your minds, in after years, these Pittsburgh sounds. The earth is the great hidden store-house of nature from whence are to be extracted the elements and instruments of our civilization. England has made herself the mistress of the sea, and the workshop of the world, by her subterranean cobwebbed labyrinths. If civil engineering has accomplished much in tunneling mountains, bridging streams and spanning continents with iron bands—which go far to annihilate time and space—it is because the science of mining engineering has furnished her the oil to supply the lamp which has enabled her to be the beacon light of our modern civilization The science of mining has brought us the gold and silver which has sustained the world's commerce. It has supplied the materials of our railroads and navies, and has revolutionized modern warfare. It is the gateway to untold treasures beneath the surface of the earth, and in proportion as it is developed will civilization advance; it is its true barometer.

The world is hurrying, humanity is awake, new wants are multiplying every hour, we are on the threshold of a new and higher civilization. The key to it, nature has placed in our hands, and it belongs to your science to unlock the treasures.

We, here in Pittsburgh, as manufacturers, have an essential interest in the success of your association. Science does not hang up horse shoes over the door of her temple for success. She unlocks the secrets of nature, and uses them to the attainment of certain ends and results. Your association offers us the light and experience and the accumulated knowledge of the past to guide us in our work. For us, the pursuits of science deserve our encouragement. Your services will show themselves in improved methods of work, and in economized means for the production of the elements in the industrial arts. May your association meet with that encouragement it richly deserves, and its members enjoy their stay here. Again, gentlemen, I bid you welcome to Pittsburgh.

THE PRESIDENT responded as follows: In replying, gentlemen, to the eloquent and cordial welcome we have just received, I am under the embarrassment of having spoken to you repeatedly before upon such occasions; but the subject of our functions, activity, and progress as an association is so vast and various that every recurring meeting gives a new view of it. We have not been in existence long enough, as an association, to exhaust even the theme of what we propose to do. The Institute had its origin in the almost blind desire upon the part of the members of our profession to combine for mutual advantage. The rhetorical exercises left in chalk on yonder blackboard contain a phrase which strikes my eye as I speak. "The gregarious elements in man." It was exactly this that we wished to utilize. We had seen the gregarious elements in man illustrated in Democratic government, in all the manufactures and trades of this country, in every social phase of modern civilization. Instead of working along, isolated, selfish, and crippled by our selfishness, we thought to find great social benefit in harmonious action. We did not know what we might accomplish. We did not expect, by merely putting our heads together, immediately to bring to pass the solution of any great and difficult problem. But we all knew that the economical development and application of the mineral resources of the country was a matter of deep commercial importance.

We knew what other nations had done and were doing. We had heard of the approaching exhaustion of their mineral resources. We had seen learned men nervously running about, calculating how long the coal and iron fields of Great Britain would hold out. We had, perhaps, never thought of ourselves except as a great and inexhaustible nation that was going to control the world after all other nations—to use a common phrase—played out. But the first meetings of the Institute brought us face to face with a question of that very character in our own country. Our anthracite coal is by no means inexhaustible. According to a calculation recently made, the present rate of production would exhaust the fields in 850 years, and a rate of production equal to that of Great Britain would exhaust them in 110 years.* It certainly becomes a matter of some importance to know whether we are utilizing our resources with due regard to economy. When it came to be proved that of the coal mined in Pennsylvania, 66 per cent. was wasted and but 33 per cent. found its way to market, I think I was justified in saying, (as I did on a former occasion,) that there was no loss in the whole of the gold and silver mining of the country as bad as the waste of the anthracite coal mines of Pennsylvania. This question at once engaged our attention. We do not find it practicable to adopt at once the methods of older nations into our different conditions; but through our able committee on the waste of coal, we are working at the problem; and I mention it to remind the members of the association, and to inform the public that we are not exclusively devoted to so-called "fanciful theory," but that we are also laboring for immediate practical results. We meet, gentlemen, in a most significant place and at a most significant time—in one of the greatest centers of the greatest industry of our country, and at a time when that industry has just crossed the line of equilibrium; when it has acquired what we trust will be henceforth an accelerated motion; when all over the world it is indicated to us that other nations have reached the summit of their power and are looking down from that summit upon our rapid and amazing growth. It is agreed on all hands that the period of equilibrium has been reached in England and she is trembling with the importance of the question whether her own coal or foreign coal must be used for her manufactories. England must take the cheapest coal. At this time our own manufactories are upon the highway of prosperity, and there are special reasons which make it a very appropriate time for us to meet together. The trouble with scientific men is that they do not know enough—and that is also the trouble with practical men! The best ground for our gathering is that one class of men knows what another class does not.

The present great demand for iron ores—the ore-famine—makes a loud call upon us mining engineers. Scientific inquiry has already borne in this respect no little fruit; and it will appear in the course of the next year or two that men who have been running about the country with hammers, and men who have been working with bottles and filters, have been gathering information of great value to practical iron masters. New sources of supply are daily opened in the South and West, and rendered available by the marvellous extension of our railway system. Take for example the rapid development of the vast coal and iron resources of Tennessee, Alabama, and other States, concerning which some of our members, unfortunately absent to-night, could give you full particulars—on the new discoveries of both coal and iron ore in the Rocky Mountains, concerning one of which I shall have the pleasure of laying a paper before you, on behalf of its distant author.

But in the great scarcity of ores, accompanied with the increasing number of blast furnaces, manufacturers are using ores of lower grade, and sometimes of less chemical purity. The result is a surplus of certain cheaper and poorer brands of iron; and the question arises on all sides—How can we produce good iron from meager or inferior ores? Now, this is not one of those questions which are by nature insoluble. If a man asks what is on the further side of the moon, which is persistently turned away from man, we may fairly doubt whether *in the absence of data*, any certain answer can be given; but we should have no sympathy with the notion that a question is unanswerable *because the data are too many*. Yet this important inquiry is not a conundrum to be guessed, but a problem to be solved. We need therefore, first of all, a careful determination of its elements; and for this, we call upon the patient observation of practical men.

But I do not wish to be understood as speaking for a body composed of theoretical students only, and appealing to some other class, called men of practice. Half our members are just such practical men, face to face in their daily business with the difficulties of theory in concrete forms; and more than half the

* NOTE.—Mr. P. W. Sheafer, of Pottsville, Pa., has prepared a plate, showing the progress of the anthracite coal trade of Pennsylvania, from 365 tons in 1820 to 15,113,400 tons in 1871. The coal product of Great Britain for 1870 is given at 110,431,192 tons. Mr. S. estimates the total contents of the anthracite region at 26,361 million tons, of which he considers one-half available by present methods. The quantity already marketed he puts at 266,666,325 tons, and this quantity is doubled to allow for waste. The allowance here made for the coal lost in pillars, overlying beds not worked, and waste in breaking and handling, is too small.

interest and value of our meetings is contributed by such men. Their coöperation is not merely generous; it is wise. The great obstacle in the application of science in this country has been selfishness as much as ignorance. A vast amount of knowledge and experience has been floating about among our people, without uniting anywhere into a stream of power. Men have been, like boys at school, "doing sums" on their slates, and then rubbing everything out, lest their neighbors should profit by it. Over and over again the same evils have been encountered with the same ignorance, and over and over again those grown wise by experience have died and bequeathed no wisdom to any heir. This is certainly not for the good of society, and I doubt if it brings gain to the individual. My own impression is, that people who try to keep secrets, as a general rule, do not make as much out of their own business in the long run as they would, by making common stock of their knowledge. At all events, there is a wide realm in which union of different minds gives strength; there is a growing disposition among students of every branch of applied science to consult with one another; and to this tendency our Institute offers a suitable channel.

But I would not undervalue what is called abstract science. A recent article in *Nature* shows very happily how the discoveries of science have speedily become the property of productive labor. From electricity we have the vast manufactures of telegraphic materials, and the employment of thousands of operators, and an incalculable increase in the facilities of commerce, as well as the great and useful business of electroplating. Investigation of the chemical effects of light led to photography, with its innumerable applications. The discovery of chlorine has given rise to a vast industry in bleaching, dyeing, and paper-making. And so on; instances might be multiplied *ad infinitum*. I will only mention one, perhaps the greatest of all,—namely, the steam-engine, which, it gives us pride to remember, was called forth by the needs, and first applied to the uses, of the mining industry. But James Watt was unable to perfect the steam engine, until he fell in with a man who could put him in possession of the "abstract" principles of specific and latent heat.

While we are dealing with the daily problems of practice, let us never lose our reverence for the dignity and value of abstract science. Many sciences contribute more or less to the mining engineer and the metallurgist. Perhaps the weakest illustration that I could draw would be taken from geology—that youngest and least complete of the sciences. If geology has done anything of practical value for mining, then we may conclude *a fortiori* that all science is worthy of our respect. Now geology has furnished us, perhaps, with fewer laws of importance and of general applicability in our profession than many people ignorantly suppose. Yet I think it can be shown that in several important particulars it has either contributed positive knowledge, or dissipated erroneous and superstitious notions, so as greatly to aid in the discovery, exploration and exploitation of mineral deposits.

[The President then briefly indicated the useful applications of geology in mining. At his request, this portion of his remarks is omitted from the present report, to be reproduced in greater completeness of detail from his pen in our columns hereafter.]

The characteristic element of modern science is the quantitative element. We want careful work everywhere; we want analysis; we want measurement; we want exact comparison; we want the universal recognition of the absolute value of the truth, and the relative worthlessness of anything short of it. We want the courage and devotion that perseveres in the dark, having an abiding faith that afterwards there shall be light. You remember how corals grow. The reef is not a building constructed by them; it is their own life that crystallizes within them, and is left behind them as they climb upward towards the light. And as they climb, the sea-bottom sinks beneath them, and the surface, only a short distance below which they can live, seems doubtless unattainable to their patient labors. Yet by-and-by it is gained, though the coral-makers die in reaching it, and over the records of their ceaseless toil appear at length the verdant fields and fruitful palms of islands that lie like gems upon the bosom of the sea.

So must we labor, climbing ever through the dim sea towards the blue sky and the perfect day, and leaving our lives behind us as we climb. The great ocean of human thought grows deeper underneath as we ascend; we get further from the bottom, yet not nearer to the top. When we reach the unclouded sunlight, it will be to die. Yet in some bright hour of the ages to come, generations of men illuminated with knowledge and clad in peaceful strength, shall look curiously and reverently upon the foundation of their prosperity, examining the progress of our labors as we study the lives and labors of the coral-makers, and shall say, "Without the patience and devotion of these, our fair, new world would not have come to be!"

The following persons, recommended by the Council as members and associates, were duly elected. [This list comprises all those elected during the sessions of the Pittsburgh meeting.]

R. NEILSON CLARK, Cañon City, Col.
E. D. PETERS, Jr., Fairplay, Col.
WM. S. SMITH, Fairplay, Col.
J. F. SCHIRMER, Denver, Col.
H. ENGELMANN, Salt Lake, Utah.
GEO. J. JOHNSON, Salt Lake, Utah.
A. J. BOWIE, Jr., San Francisco, Cal.
AND'W H. MCCLINTOCK, Wilkesbarre, Pa.
A. J. BROWN, Hamilton, Nev.
JACOB REESE, Pittsburgh, Pa.
GEO. ASMUS, New York City.
A. FABER DU FAUR, New York City.
LOUIS JANIN, Jr., San Francisco, Cal.
WM. ASHBURNER, San Francisco, Cal.
E. G. DE CRANO, San Francisco, Cal.
ALEX. TRIPPEL, New York City.
JAS. A. MULHOLLAND, Mount Savage, Md.
NATHANIEL BALLIE, Uniontown, Pa.
J. S. CHAMBERLAIN, Lectonia, Ohio.
A. B. CORNELL, Youngstown, Ohio.
JOHN C. KENT, Phillipsburg, N. J.
WM. ST. G. KENT, Phillipsburg, N. J
J. F. KEELER, Pittsburgh, Pa.
DWIGHT D. WILLARD, Bordentown, N. J.
J. G. BUTLER, Youngstown, Ohio.
THOS. N. MILLER, Pittsburgh, Pa.
WM. A. SWEET, Syracuse, N. Y.
W. H. VAN ARSDALE, Swansea, Inyo Co., Cal.
CHS. VON LIEBENAU, South Mountain, Idaho.
HERMANN STOELTING, Georgetown, Col.

The following resolution was offered by Mr. DROWN:

Resolved, That gentlemen present, not members, be invited to take part in the discussions of the Institute at the various sessions of the present meeting.

Carried unanimously.

Mr. E. PECHIN, of the Dunbar Iron Works, then read the following paper on

THE POSITION OF THE AMERICAN PIG IRON MANUFACTURE.

The iron trade of America seems on the point of a new departure. After years of struggling against heavy odds, patient endurance in periods of depression and loss, fears and hopes alternating as failure or success seemed to be the penalty or reward; wanting in sufficient capital, embarrassed by reason of imperfect knowledge and lack of skilled labor, confronted by a powerful foe—every doubt has at last vanished, physical and mechanical difficulties have been largely overcome, capital has become more abundant and remunerative, the excellence of our product has been everywhere established, and the peculiarities of American character—pluck, energy, and perseverance—have at last placed the trade upon a foundation so broad and stable, that upon it we begin to erect the structure of a world-wide business.

Concerning the future of the iron trade in the United States there can be but little doubt.

The growing scarcity and constantly increasing cost of raw material in Great Britain, their loss of labor by emigration, the social disturbances among the working classes, assuming a more threatening attitude on each new outbreak; the rapidly decreasing value of money, in consequence of the enormous production of gold and silver, combine to forbid any return to former prices, and indicate that a point has been reached beyond which any marked increase of production is improbable.

The same causes are operating to a greater or lesser extent upon the continent.

In the meanwhile the growing wants of humanity are rapidly outstripping these sources of supply. In addition to the steadily increasing foreign and home demand, we find, the world over, the most intense activity everywhere displayed in enterprises requiring prodigious quantities of iron. Railways of colossal magnitude are building or projected in Russia, Australia, the East Indies, North and South America, and now the hoary and laggard East unbars its venerable portals and invites, with open arms the fresher and nobler civilization of the West to renew its life by giving to it what the other, out of its own fertile brain, has created.

In the United States, irrespective of the 60,000 miles of railroad to be maintained, and the 5,000 miles annually building, the uses of iron are almost infinite. Day by day the application of iron and steel in new directions, and in novel forms, is increasing.

It is authoritatively stated that at the present rate of annual consumption, in eight years the forests of Maine will have disappeared. In the Northwest the ravages of fire and the ax of the woodman are rapidly diminishing that source of supply. This growing scarcity of timber is *compelling* the use of iron in buildings—bridges of wonderful size and strength—huge ocean steamships—barges and boats for lake and river traffic—churches—cars, and thousands of minor articles of every shape and size. Thus, looking over the whole field of operations, the present is most favorable—the future most promising. Thus far what has been said applies equally to all branches of the iron and steel business. What follows is applicable more particularly to the manufacture of pig iron.

That the stocks of raw irons are inconsiderable the world over, seems to be admitted. No better evidence is needed than the present scarcity and high price. The chances are against any material increase abroad; so that the only matter likely to disturb the home market is excessive domestic competition.

From the very nature of the business, it can only be increased with moderate rapidity. Under the most favorable circumstances it takes a long time to build a modern furnace; the capital required is very great, allowing only men of large means to engage in such an enterprise. The localities naturally adapted to the business are comparatively few. A still greater obstacle is the time and money needed to open mines and deliver material. Whether the furnaces in existence to-day can obtain full supplies of ore for the ensuing year is by no means a settled question, and, from all the data obtainable to day, the probabilities are against it.

The outlook, therefore, is favorable.

But all this may change; excessive prices may check consumption, and a falling off of demand may cause lower prices, and possibly loss; unexpected crises may come, just as they have come before causeless panics may again unsettle trade. It is, therefore, a duty that each man owes to himself to ward off disaster by present watchfulness.

There is, however, a higher stand-point to take—a nobler aim to strive for, than merely present gain

[CONTINUED ON PAGE 282.

SANTO DOMINGO AND ITS RESOURCES.

BY WILLIAM M. GABB, GEOLOGIST.

CONCLUDED.

LITTLE need be said about fisheries. The coast abounds in fish, and the market of Santo Domingo City is proportionally as well supplied in this respect as that of New York. But away from this one point, almost no attention is paid to what might be a very productive industry.

Nor do manufactures deserve more attention. Some spasmodic efforts have been made at various times by foreigners, to extract the fibre of the Cabullo plant. The fibre is very long, very strong, and not very coarse. It is said to be but little inferior to Manilla hemp for rope. It is prepared by hand by the natives, by bruising the long leaf, (which looks like that of the Mexican aloe,) and then scraping it with a dull knife, or a piece of wood. No machinery yet tried here seems to accomplish the desired result, though doubtless, with proper appliances, profitable results could be obtained. The plant grows wild everywhere and no care is required in its cultivation. Numerous other plants occur which might be rendered available for paper making, and there is no reason why the coloring matter of logwood and fustic should not be extracted here, rather than the wood exported. Nine tons of logwood give one ton of extract; and making it here rather than abroad will thus give a clear saving of freight on eight tons, besides commissions and all the other incidental expenses.

In an area as great as Santo Domingo, and as diversified by mountain and valley, with such a variety of surface and of altitude, there must necessarily be a great variety of climate. To increase this, the island lies directly in the line of the trade winds, with its principal valleys opening to windward, and drawing in the currents laden with the moisture of the Atlantic. The greater part of this moisture deposits itself on the eastern half of the island, keeping it well watered by a never failing supply; while the western end remains comparatively dry; and Monte Cristi and Azua are sometimes for a year without a shower.

Although in the tropics, the heat is never very great. The total annual variation in Santo Domingo City is hardly ever 25° of Fahrenheit's scale. The coldest nights of February rarely get below 61° or 62°, while the hottest noons of August rarely reach 90°. The writer once encountered a night temperature of 47º at a height of 5500 feet on the flank of the Peak of the Yaqui, and the highest reading of the thermometer he ever saw in the Republic was 92° about the last of July, 1870, in the interior town of La Vega. But all of these are extremes, and the exception is to see the mercury range below 70° or above 82° or 83°. In such mountain valleys as Jarabacoa, Constanza and Maniel, the cold, at night, is much greater, and at Constanza the more delicate tropical fruits do not flourish; thus, plantains do not acquire more than half their normal size; but on the other hand, northern fruits thrive the better; apples and peaches can be raised there, and tradition says that the Spaniards formerly cultivated wheat there. In short, so far as climate is concerned, there is nothing in Santo Domingo to debar the denizen of the north, be he white or black, from settling here, working in the open air, and doing the same amount of labor that he would perform under an equal temperature in his former home.

Nor is the country unhealthy. Yellow fever does *not* exist in the Republic of Santo Domingo; and while it is a regular visitant at Port au Prince in Hayti, at the other end of, the island, it never has existed in the Spanish part, except as it occurs every year in New York harbor, introduced on board of vessels from infected ports. And even then, when it does appear among the shipping, it never spreads. It is claimed that yellow fever never exists in any West Indian port, where the trade winds have reasonably free access. All of the principal ports of the Republic are thus exposed, and in none of them does this terrible scourge of the tropics exist. During the last Spanish occupation, the Spanish troops were hemmed in towards the last, inside the walls of the capital. Then, want of cleanliness, bad food, bad ventilation, and all the evil influences to which soldiers persist in subjecting themselves, brought on an epidemic of cholera. But even this should rather be called endemic than epidemic, since it hardly spread beyond the troops, and did not get beyond the walls.

The only disease to which the newly arrived foreigner is liable is the "country fever." It does not follow that he will have it; and should it attack him, it is so trifling a matter that, with the mildest of remedies, he need suffer but a trifling inconvenience. It is simply a mild form of the same "chills and fever" which attack so many of the settlers in the West, and which exists in as bad, or perhaps even worse form on both sides of Chesapeake Bay. In the "States," certain precautions are taken by all to avoid "catching cold." In Santo Domingo, a different kind, and even a less amount of care is necessary to avoid catching "the fever;" and once attacked by the latter, the patient is quicker and more easily cured than from the former. The writer has been exposed to more risk than any ordinary settler can ever run, travelling for three years at all seasons, exposed to the hottest suns of the savanas and drenched by rains for days together, and yet has never suffered a day's illness in consequence. In a word, taking everything into consideration, Santo Domingo is fully as healthy as any equal area of the United States. Like every other country, it has its local diseases, but they are neither more dangerous nor more difficult to cure, than those of the north.

Having described the country, its productions and its climate; it only remains for us to consider, as briefly as possible, the probability of its offering a home for people of northern birth, and whether the inducements it offers to such persons, are greater than those held out by the yet available po tions of our own country.

The country has just been described as offering no impediments. The northern farmer can work in Santo Domingo all the year round, as easily as in his harvest field at home. Land is cheap and easily procurable. A much smaller tract will support a family here than in the north. An acre of plantains not only yields as much as many acres of potatoes or wheat, but once planted needs never to be renewed. It commences to bear in a year from planting, and from then forward, yields a continuous crop, sufficient of itself to support a large family.* The merest pretence of labor in planting other vegetables, secures a prompt and abundant supply, and the settler, prepared to depend on the on the markets, or his previously provided stores for the first three or four months, while making a beginning, can after that maintain himself on the fruits of his own labor. He has another advantage. He can thus support himself for the first four years, planting permanent crops, such as coffee, cacao, or fruit trees in the meantime, and as soon as these begin to yield, he has not only a living secured from week to week, and month to month, but he is certain of a steady income for the rest of his life. How few northern farmers can look forward to more than an annual succession of seed time and harvest, a continuous toil for a bare subsistence until death closes the scene!

If he needs farm laborers, the people of the neighborhood will be willing, nay more, anxious to assist him for an almost nominal price. Ten dollars a month, without board, is considered good pay, to day, in the vicinity of Santo Domingo City. Labor contracted for, is usually estimated on a basis of from 25 to 40 cents per day. And here a little warning is probably advisable. West Indian laborers are not as industrious as those of a colder climate, and experience proves, even more strongly than in the North, that work done by contract is cheaper "in the long run" than that paid for by the day. The people of the country are simple hearted, honest and reasonably industrious when inducement is offered. The stranger need fear no violence, the settler needs no arms for his defence. The writer has travelled over all parts of the Republic, for a space of three years, often alone, and as often unarmed, or with an empty pistol as with a loaded one and never had the slightest reason to suspect, even, that he was in danger of any molestation.

One great advantage possessed by the farmer in the tropics, over him of a cold country, is that all of his labor is productive, and he need waste none in providing against winter. He need lay up no store of winter supplies; he has no immense stock of fire wood to prepare: his clothing is simple linen or other thin goods, in place of an expensive stock of woolens; he needs no great barns and stables, no sheds even to shelter his stock: his cattle live day and night, all the year round under the open sky, sheltered only by the trees; his house even, instead of an expensive structure built as a fortress against the assaults of "Jack Frost," is simply a shelter from the rain and sun, without a pane of glass in the windows, and with hardly a fastening to the doors.

The class of persons suitable to emigrate to a new country, and more especially one like Santo Domingo, where the emigrant encounters new manners and customs and a strange language, and has to form an entirely new set of habits, to adapt himself to the climate, the country and his neighbors, must be a subject of serious consideration. It is the exception rather than the rule, even among Americans, who are noted for great adaptability to new surroundings, to find one who can thus change his whole manner of life, and remain contented. The emigrant must bear this in mind, and count well the cost, before he commits himself.

Professional men, clerks, and persons in general who expect to earn an easy living by teaching, or the pursuit of a profession; who expect to labor with brain rather than hands, had better stay away. They are not wanted; they will find no field for the exercise of their talents; they will not be appreciated and perhaps not more than one in a thousand would succeed. Even mechanics must not be too sanguine that they can work at a trade and compete with the native workman. A few good carpenters and blacksmiths *might* make headway, but no other trade would have much hope. The great field for the new comer is farming. But to be a successful farmer, a man must be willing to work himself or to stand over his laborers and see that each does his duty—he must "either hold the plough or drive." He must bring with him a pair of strong and willing arms and at least a thousand dollars. He may then, if his efforts be well directed, anticipate success.

There are plenty of drones here now. What the country needs is earnest, energetic workers. It would be better for such to come in companies than alone. And they would do better to make some previous preparations, such as to secure their land in advance, have some suitable shelters erected, and even have some planting done, before the main body arrives. In this way they can reduce almost to nothing the possible chances of failure.

SANTO DOMINGO CITY, April 3rd, 1872. WM. M. GABB.

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* Buckle, (Hist. of Civilization, etc., vol. i., pp. 79-80.) says of the plant: "Of its nutritive powers, it is enough to say, that an acre sown with it will support more than fifty persons; whereas the same amount of land sown with wheat in Europe, will only support two persons. As to the exuberance of its growth, it is calculated that, other circumstances remaining the same, its produce is forty-four times greater than that of potatoes, and a hundred and thirty-five times greater than that of wheat." See also Humboldt's *Nouvelle Espagne*, vol. ii., pp. 362-363.

THE COAL TRADE.

NEW YORK, Oct. 26th, 1872.

Great activity in house coals continues to mark the course of trade. The Pennsylvania Company has put up its price fifteen cents a ton on stove coal, other sizes remaining as they were. A good business is done in these also, but the only pressure felt is in the small sizes. As the close of the month approaches, the talk of increased rates grows more definite. A meeting of those who represent the great companies, has been had, and though nothing positive is announced, it is pretty well understood that an advance of twenty-five cents a ton will be made. This movement is less boldly made than that of a month ago, and those concerned seem inclined to leave it an open question until the last moment. The Reading road has advanced its tolls fifteen cents, and coal ten cents in addition; a fact which will do much to determine action here in New York. The Scranton sale will take place on Wednesday next, when 75,000 tons will be bid for. It is the general impression that an advance will be made, and that the average will be in the neighborhood of twenty-five cents. Of the course the small coals will take there is no doubt. The market for them is better than it has been for two years, and they must advance, in obedience to a strong demand. Steamboat furnace and grate sizes are doubtful, but the present rates will probably be maintained.

The diffidence with which dealers receive propositions to put up prices in a decided measure, and which we have before remarked upon, continues and exerts a healthy check upon what speculative feeling there is. The general propriety of conduct seems to have killed the little excitement there was at one time, and with all the request for stove coals, the market is quiet and very firm. On all sides we hear the best auguries for the coming season.

Bituminous Coal.

Trade is good in Bituminous coal, but the amazing stories with which the newspapers have teemed, of heavy transactions in Cumberland coal on English account, are perhaps somewhat overdrawn. Large orders are undoubtedly out both in Georgetown and New York, and a good trade to ports hitherto supplied from England is going on. But this kind of business is necessarily dependent upon the rates of freight, and it is nonsense to represent the English as permanently deprived of this business. We shall be lucky if it continues in our hands long enough to give our new customers a taste of the quality which we can furnish them, and teach the world something practical and real of American coals.

A large proportion of the Cumberland product now comes by rail to Amboy, over the new line. The rates have been adjusted to correspond with those by water, and the companies handling coal from this region, can now look forward to the closing in of winter without apprehension; they have a clear passage to all markets, in all weathers, and need no longer lay in the enormous stocks which have so seriously burdened them in previous seasons. This new route is of importance, not only as a means of delivery for the product of those mines, but as a new solution of the great problem of cheap transportation on railways. It is a new phase of the rivalry between water and land, a competition that grows every day more close, and one which will continue for years if not always, to be a main question in the economy of our country.

The Connellsville region has been the scene of a limited strikes, of which we have the following account from the Pittsburgh *Gazette*.

"For some time past there have been rumors of a probable strike among the miners at coal works along the line of the Connellsville railroad. The men have made their demands and they have been partially acceded to, and the effect will probably be this week to raise the price of coal one and one-half or two cents per bushel.

"Last Tuesday the men in both of Armstrong's works, the one at Osceola, and the other at Armstrong's Station came out of the mines and refused to resume work until their wages were increased from four cents, the price then paid, to five cents per bushel. They then visited the Coal Hollow Coal Company's works at Shaner's Station and tried to induce the men there to come out, but were unsuccessful.

"The Armstrong works decided on Saturday to accede to the demands of the strikers, as did also the proprietors of the Coal Hollow works, although the men of the latter had not struck. Moore's works will not accede to the demands made and will probably suspend. Biglers, of Alpsville, have not yet been heard from. There is a limited supply of coal, and the increase generally goes above the advance allowed the miners, as the haulers and other workmen nearly always come in also with a demand for increased profits.

Anthracite Coal Trade for 1871 and 1872.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending October 19, 1872, compared with the week ending Oct. 21, 1871.

COMPANIES.	1871. WEEK.	1871. TOTAL.	1872. WEEK.	1872. TOTAL.
*Phila & Reading R.Rt..	148,547	4,501,164	146,555	4,691,014
*Schuylkill Canal	31,338	837,529	27,283	702,119
*Lehigh Valley R. R. ..	75,319	1,833,424	64,566	2,676,982
Lehigh & Sus. R. R.....	34,453	926,485	32,726	1,390,952
Lehigh Canal	34,159	577,880	25,962	652,177
Scranton North.....	19,230	417,323	24,866	625,084
" South	42,723	907,968	35,710	1,692,921
Penn. Coal Co., rail.....	26,729	660,494	27,930	971,947
" " " canal.....	976	11,918	238	5,272
Del. & Hud. Canal Co....	36,726	807,109	53,032	1,215,538
" " East..	11,227	257,338	5,363	464,819
" " West..	4,214	90,109	11,995	330,676
" " South.	10,551	249,936	8,643	†313,554
Shamokin.....	13,425	518,891	14,200	451,021
Trevorton.....	....	.....	.....	.....
Lykens Valley Coal Co....	....	71,965	.....	2,085
Wyoming North.....	....	.....	.....	.....
Wyoming South.....	....	.....	.....	.....
P. N. Y. C. & R. R. Co..	....	104,987	12,077	513,682
Williamstown Col'y.....	....	....	....	....
Big Lick Col...	....	113,791	....	10,591
Total.	490,217	12,848,371	491,166	16,713,434
1870.....			490,217	12,848,371
Increase.			949	3,865,063
Decrease.....				

* These figures are for the week and fiscal period commencing Nov. 30

† Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1871 and 1872.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Oct. 19, 1872, compared with week ending October 21, 1871.

COMPANIES.	1871. Week.	1871. Year.	1872. Week.	1872. Year.
C. & O. Canal.....	13,454	566,820	19,516	536,827
B. & O. R. R.....	24,821	997,099	27,772	1,004,731
H. & B. T. R. R.....	6,243	259,184	6,915	243,623
*Harrisburg & D.....	9,424	444,558	10,494	409,642
*L. V. R. R....	7,714	324,222	596	23,758
P. & N.Y.C. & R. Co.....	....	.....	5,525	301,608
{Cumberl'd Branch Canal	2,968	165,924	5,193	179,853
{ " Railroad....	829	57,293	937	17,398
Total.....	65,453	2,815,100	76,948	2,717,440
		2,717,440	65,453	
Decrease.....		97,660	.....	
Increase].....			11,495	

Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending Oct. 19, 1872, with totals to date, compared with same time last year.

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	TOTAL Tons. Cwt.
Total Wyoming.....	8,577 10	452,268 14
" Hazleton.....	48,737 19	1,947,705 16
" Upper Lehigh.....	66 17	2,509 04
" Beaver Meadow.....	18,362 06	678,783 06
" Mahanoy.....	9,792 10	334,191 18
" Mauch Chunk.....	11 10	2,498 17
Total.....	85,548 12	3,417,955 15
Same time last year.....	100,380 16	2,282,317 01
Increase.....		1,135,138 14
Decrease.....	14,832 04	
Forwarded East from Mauch Chunk by rail.....	64,566 01	2,676,982 05
Same time last year.....	75,318 14	1,833,423 18
Increase.....		843,558 07
Decrease.....	10,752 13	

DISTRIBUTED AS FOLLOWS.

Forwarded East from Mauch Chunk by rail.....	64,061 09	2,636,364 11
do East for use L. V. R. R.....	504 12	40,617 14
Delivered at and above Mauch Chunk for use of L. V. R.R.....	1,170 02	49,978 11
To P. & N. Y. R. R.....	6,310 16	316,313 12
To N. C. R. R., at Mount Carmel.....		2,156 06
To D. H. & W. R. R.....	663 12	26,039 06
To L. & S. R. R. at Packerton for rail....	340 07	11,430 11
Delivered at M'h Chunk.....	69 08	1,727 00
Delivered on line of road above Mauch Chunk..	281 10	13,781 13
To L.S.&R.R., at Penn Hav., for railroad	7,170 13	4,011 19
Do. for canal		200,008 10
To Lehigh Canal Mauch Chunk.....	4,976 03	105,900 07
To Catawissa Railroad.....		9,625 16
Total.....	85,548 12	3,417,955 15

Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, October 19, 1872.

	Tons. Cwt.
From Schuylkill Haven.....	24,750 15
" Port Clinton	2,532 00
Total for week.....	27,282 15
Previously this year.....	674,836 15
	702,119 10
Total...	
To same time last year..	837,528 17

Delaware Lackawanna & Western Rail Road Company.

Coal transported on the Delaware, Lackawanna, & Western Railroad for the week ending Saturday, Oct. 19, 1872.

	WEEK. Tons. Cwt.	YEAR. Tons. Cwt.
Shipped North.....	24,866 02	625,084 08
Shipped South.....	35,710 00	1,692,920 15
Total.....	60,576 02	2,318,005 03
For the Corresponding time last Year :		
Shipped North.....	19,829 17	417,422 14
Shipped South.....	42,723 01	907,968 08
Total.....	62,552 18	1,325,391 02
Increase.....		992,614 01
Decrease.....	1,976 16	

Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, Oct. 19, 1872.

BY RAILROAD.—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

	Tons.	Cwt.
From St. Clair.	35,396	06
" Port Carbon.	5,813	16
" Pottsville.	2,924	04
" Schuylkill Haven.	31,064	16
" Pine Grove.	4,739	09
" Tamaqua.	19,246	02
" Harrisburg.	9	07
" Dauphin.	6,345	13
Total	104,541	13

FOR SHIPMENT BY CANAL.

Passing Frackville Scales	2,281	19
" Mill Creek "	1,905	03
" Schuylkill Valley Scales	582	07
" Mt. Carbon "	1,235	09
" Cressona "	11,385	04
" Pine Grove "		
" Tamaqua "	1,268	05
Total	25,656	07

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

Passing Locust Gap.	1,975	00
" Shamokin.	4,592	16
" Herndon.	.....	
Total	6,567	16

SHIPPED WEST OR SOUTH FROM PINE GROVE.

Via Schuylkill & Susquehanna R. R.	1,278	11
" Lebanon & Pine Grove Branch	857	10
Total	2,136	01

CONSUMED ON LATERALS.

From Frackville Scales.	678	05
" Mill Creek "	360	17
" Schuylkill Valley Scales.	1,053	18
" Mt. Carbon "	1,111	07
" Cressona "	754	02
" Pine Grove "	78	03
" Tamaqua "	1,150	19
Total	5,187	02

LEHIGH AND WYOMING COAL.

Received via Allentown, E. Penn'a Br.	192	18
" " Alburtis, " "	11	02
" " Oreland, G. & N. Br.	1,404	06
" " Connecting R. R.	.....	
" " Willow Street R. R.	555	19
Total	2,163	15

BITUMINOUS.

From Harrisburg.	18,484	04
" Connecting R. R., G. & N. Br.	.....	
" Junction R. R.	10	00
Total	18,494	04

COAL FOR COMPANY'S USE.

Anthracite	6,596	01
Bituminous	277	04
Total.	6,873	05

RECAPITULATION.

	Total for Week.	Corresp'g week last year.	Increase and Decrease.
Passing over Main Line and Leh. Val. Branch	104,541 13	107,144 09	d 2,602 16
For Shipment by Canal	25,656 07	27,085 00	d 1,429 13
Shipped Westward via Northern Central R. R.	6,967 16	6,994 08	i 883 08
Shipped West or South from Pine Grove	2,136 01	2,779 17	d 643 16
Consumed on Laterals	5,187 02	3,671 14	i 1,515 08
Lehigh and Wyoming Coal	2,163 15	1,878 10	d 285 05
Total Anthracite paying freig't	146,554 14	149,546 18	d 1,992 04
Bituminous	10,494 04	9,424 07	i 1,069 17
Total of all kinds paying freig't	157,048 18	157,971 05	d 924 07
Coal for Company's use	6,873 05	6,118 15	i 754 10
Total Tonnage for Week	163,922 03	164,090 00	d 167 17
Previously this year	5184425 14	4975169 17	i 209,255 17
Total to date	5348347 17	5139259 17	i 209,088 00

SHIPPED BY CANAL.

From Schuylkill Haven	24,750 15	27,790 06	d 3,039 15
" Port Clinton	2,532 00	3,159 00	d 627 00
Total Tonnage per Week	27,282 15	30,949 00	d 3,666 85
Previously this year	674,836 15	816,787 17	d 141,951 02
Total to date	702,119 10	847,736 17	d 145,617 07

Report of Coal Transported over Central R.R. of N. J. (Lehigh and Susq. Div.)

Week ending October 19—Compared with same time last year.

WHERE SHIPPED FROM	WEEK 1872. tons ct	WEEK 1871. tons ct.	YEAR 1872 tons cwt.	YEAR 1871. tons.cwt.
Wyoming Region	29086 16	35741 11	1195569 11	1014603 09
Upper Lehigh Region	4669 14	4244 00	16 512 03	78299 12
Hazleton Region	7404 12	11739 11	297963 11	161987 13
Beaver Meadow Region	4417 12	5239 12	129985 04	55942 00
Mauch Chunk Region	8412 15	6793 10	358477 03	169231 11
Treskow Region.....				
Mahanoy Region				
Totals	54891 09	61758 04	20544 7 12	1473614 04
Increase			589973 08	
Decrease	6866 15			
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	32726 04	34453 00	1290862 00	966485 05
Forwarded East of Mch Chunk by Canal	16731 10	20251 12	419646 12	332097 09
Delivered at and above Mauch Chunk	1328 01	3196 17	48746 17	52571 08
L. V. R. R at Packer'n	205 16	434 01	11638 18	26148 16
Delivered to L. & B. R. R.at Plymouth Bridge	3899 18	3422 14	183608 05	77116 06
Totals				
Of the above there was transported on acc'nt of L. U. & N. Co	15531 04	10752 19	532268 18	249386 18
W.-B. C. & L. Co.	16408 02	20555 13	795638 00	684871 06
Totals	31939 06	31308 13	1327904 18	934258 04
Increase			393646 14	
Decrease	630 14			

Penn. and N. Y. R. R.—Coxton, Pa.

Coal tonnage for week ending October 19, 1872.

	Week. Tons.	Cwt.	Total. Tons.	Cwt.
Anthracite received:				
From Lehigh Valley R. R.	6,310	16	316,313	12
" Lack. & B. R. R.	1,271	08	67,323	14
" Pleasant Valley R. R.	3,169	08	85,099	03
" Sul. & Erie R. R.	1,325	15	44,945	19
Total	12,077	07	513,682	08
Distributed:				
To Lehigh Valley R. R.	840	11	32,693	07
To Lack. & B. R. R.	11	08	1,045	08
To S. Central R. R.	2,720	03	96,495	16
To Ithaca & A. R. R.	1,476	12	79,686	16
To Erie R. W. Pockets for shipm't.	4,495	13	232,244	12
To individuals on line of road	795	17	19,168	04
To points at & above Coxton for use of Co.	348	08	20,629	10
To points between Waverley and Elmira	1,388	15	31,719	01
Total	12,077	07	513,682	08
Bituminous received from BARCLAY R. R.				
Shipped north from Towanda	5,423	16	299,209	18
Shipped south from Towanda	55	18	2,136	05
Northern Central R. R.	45	10	262	00
Total	5,525	04	301,608	03
Distributed:				
To Erie Railway	4,997	00	269,685	15
To So. Central R. R.	353	18	29,274	00
To Ithaca Valley R. R.	62	18	120	03
Lehigh Valley, R. R.	....		1,201	01
To individuals on line of Railroad.	101	08	1,072	00
To points on line of road for use of Company	....		255	04
Total	5,525	04	301,608	03
Grand totals transported:				
Anthracite	12,077	07	513,682	08
Bituminous	5,525	04	301,608	03
Total	17,602	11	815,290	11

Lehigh Coal and Navigation Company,

Report of Coal transported over the Lehigh Canal and L. & S. Div of Central Railroad of New Jersey for the week ending Oct. 19, 1872, and for the year 1872.

	WEEK.	YEAR.
Forwarded East of M'ch Chunk by Rail	32,726 04	1,390,952 00
Delivered at and above do.,	1,328 01	48,746 17
Forwarded East of do., by Canal	25,962 05	652,176 19
	60,016 10	2,091,875 16
Corresponding period last year—		
Forwarded East of M. Chunk by Rail	34,453 00	986,485 05
Delivered at and above do.,	3,196 17	57,571 08
Forwarded East of do., by Canal	34,159 03	577,879 17
	71,809 00	1,616,936 10
Increase on Railroad	.....	400,642 04
Decrease " "	3,595 12	
Increase on Canal	.....	74,297 02
Decrease " "	8,196 18	

Of the above there was transported on account of—

Lehigh Coal Nav. Co.	22,529 07	744,774 03
Wilkesbarre Coal & Iron Co.	16,408 02	795,636 00
	38,937 09	1,540,410 03
Corresponding period last year—		
Lehigh Coal & Nav. Co	21,700 07	460,487 13
Wilkesbarre Coal & Iron Co.	20,555 13	684,871 06
	42,256 00	1,145,358 19
Increase	.....	395,051 04
Decrease	3,318 11	

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company for the week ending Saturday, October 19, 1872.

	WEEK.	SEASON.
North	54,777 15	2,070,566 16
South	8,643 03	313,553 17
Total 1872	63,420 18	2,384,120 13
Corresponding time in 1871:		
North	55,819 11	1,108,717 12
South	10,551 05	249,935 16
Total	66,370 16	1,418,653 08
Increase North		
Decrease North		
Increase South		
Decrease South		
Total increase 1872		963,467 05
Total decrease 1872	2,949 18	

Northern Central Railway, Shamokin Division.

Below is the return of Coal sent over the Shamokin Division of the N. C. R. W., for the week ending October 19, 1872.

	Tons.	Cwt.
East	2,042	02
West	12,157	18
	14,200	00
Same time last year	13,425	05
Increase	774	15
Decrease	.....	
Total amount shipped to date	451,020	17
Same time last year	518,890	15
Increase	.....	
Decrease	67,869	18

Pennsylvania Coal Company.

Shipments of Pittston Coal for the week ending October 19, 1872.

	1872. WEEK.	1872. YEAR.	1871. WEEK.	1871. YEAR.
By Railway	27,929 12	971,946 16	26,728 16	560,453 12
" Canal	237 18	5,272 05	975 10	11,918 06
Total	28,167 10	977,219 01	27,704 07	572,371 18
Increase 1872	404,847 03			

Lehigh Canal Coal Trade.

Shipped for the week ending October 18, 1872.

	Week. Tons.	Cwt.	Week. Tons.	Cwt.
Total from Mauch Chunk Region	6,998	03	212,605	05
" " Hazardville "	1,490	07	4,965	09
" " Beaver Meadow "	5,188	16	130,998	10
" " Mahanoy "	681	00	9,878	06
" " Hazleton "	7,170	13	199,542	03
" " Upper Lehigh "	555	19	24,253	12
" " Wyoming "	3,877	07	70,043	14
Total	25,962	05	652,176	19
Corresponding week last year	34,158	03	577,879	17
Increase	.....		74,297	02
Decrease	8,196	18		

Delaware and Hudson Canal Company.

The following is a statement of Coal Transported by the Delaware and Hudson Canal Co. for the week ending Oct. 19, 1872.

	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	53,032	1,215,538
By Railroad, East	5,383	464,819
" " West	11,995	330,676
" " South	8,643	313,554
Total Tons	79,053	2,324,587
For the same period last year.		
	FOR THE WEEK.	FOR THE SEASON.
By Delaware and Hudson Canal,	36,726	807,109
By Railroad, East,	11,227	257,338
" " West	4,214	90,109
" " South	10,551	249,936
Total Tons	62,718	1,404,492
Increase	920,095	

Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday Oct. 19, and during the year 1872, compared with the corresponding period of 1871.

WEEK.

	To C. & O. Canal Tons.	Cwt.	To B. & O. R. R. C. Tons.	Cwt.	Total. Tons	Cwt.
1872	19,515	11	27,771	12	47,287	03
1871	13,453	11	24,821	09	38,275	00
Increase	6,062	00	2,950	03	9,012	03
Decrease			.....			

YEAR.

1872	536,826	16	1,004,730	15	1,541,557	11
1871	566,819	17	997,098	13	1,563,918	10
Increase	.....		7,632	02		
Decrease	29,993	01			22,360	19

Cumberland Branch R. R.

WEEK.

	To C. & O. Canal. Tons.	Cwt.	To B. & O. R. R. Co. Tons.	Cwt.	Total. Tons.	Cwt.
1872	5,192	15	937	09	6,130	04
1871	2,967	12	829	03	3,797	00
Decrease	.....		.....		.....	
Increase	2,225	03	108,01		2,333	04

YEAR.

1872	179,852	17	17,397	19	197,250	16
1871	165,923	18	57,293	06	223,217	04
Increase	13,928	19				
Decrease			39,895	07	25,966	08

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

	AT NEW YORK. October 25. R. A.	W. A.	AT PHILADELPHIA. October 25. R. A.	W. A.
SCHUYLKILL.				
Lump	$—	$—	— —	
Steamer	— —	— —	— —	— —
Broken	— —	— —	— —	
Egg	5 25	4 75	— —	— —
Stove	5 50	5 00	— —	— —
Chestnut	4 25	— —	— —	
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)	5 35	— —	— —	— —
Broken	4 60	— —	— —	— —
Egg	4 60	— —	— —	— —
Stove	4 85	— —	— —	— —
Chestnut	4 35	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*				
Honey Brook, Le'h	W.A. 4 00@5 00		— —	— —
Spring Mountain	" — —@— —		— —	— —
Sugar Creek	" — —@— —		— —	— —
Sugar Loaf	" — —@— —		— —	— —
Old Comp'y's	" 4 00@5 15		— —	— —
Room Run	" 4 00@4 50		— —	— —
McNeal	" — —		— —	— —
Girardville	" — —		— —	— —
Hill & Harris	" — —		3 10@4 00	— —
Shamokin	" — —		— —	— —
Lykens Valley	" — —		— —	— —
Broad Top	" — —		— —	— —
McMichael	" — —		3 25@4 25	— —
Henry Clay	" — —		— —	— —
Powelton	" — —		— —	— —

Company Coals.

October, 1872.

	L.	Str.	Gra.	Eg.	Sto	Chest
*Scranton at E. Port	3 45	3 45	3 65	3 70	4 00	3 50
*Pittston at Newburg	3 80	3 80	3 80	3 80	4 00	3 80
*Lackawana at Weehawken	4 00	4 10	4 10	4 30	4 00	3 60
Wilk'b're at Hoboken	3 60	3 65	3 85	3 85	4 60	4 10
Old Co. Lehigh at PtJohn's	5 25	—	4 50	4 50	4 60	4 60
Lehigh at Eliz. Port	a 5 00	—	4 60	4 60	4 80	4 00

For freights to different points see "Freights."
To contractors only.

Prices at Baltimore—October, 1872.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 20@5 35
Pittston and Plymouth, do	4 90@5 15
Shamokin Red or White Ash, do	5 10@5 30
Lykens Valley Red Ash, do	6 00
Zerba Valley	
Treverton	
By retail, all kinds per ton of 2,240 lbs	6 50@8 00
George's Creek and Cumberland f. o. b. at Locust Point for cargoes	@4 75
Fairmont and Clarksburg gas f. o. b. at L. Point	6 00

BITUMINOUS COALS.

Kittaning Coal Co.'s Phœnix Vein, f. o. b. at Phila	$
Lemon " " "	
Cumberland Vein Coal	
Consolidation Coal Co.'s on board	N. Y.
Maryland Coal Co	"

Prices at Georgetown, D.C., and Alexandria, Va.

October, 1872.

George's Creek and Cumberland f. o. b. for shipping	$4 25@4 35

Prices at Havre de Grace, Md.

October, 1872.

Wilkesbarre and other White Ash for Cargoes	$ @5 00
Lykens Valley	@5 00
Shamokin Red or White Ash	4 75@5 00

Bituminous Coals (Cumberland).

Georgetown, F.o.b.	$4.25
Baltimore	4.65
New York	6.60

Prices of Gas Coals.

October, 1872.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr., 41-43 Pine st., N. Y

	Coarse.	Slack.
Block House	$1 60	$— 75
Gowrie	1 60	— 75

Vessels are being chartered at $3 00 to $3 25.

Corrected by Bird, Perkins & Job, 27 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25	1 25
Sydney	2 25	- 80
Lingan	1 60	- 80
Caledonia	1 60	- 80

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty on all slack coal or Culm: 40c. per ton of 28 bushels, 80 pounds to the bushel. On all bituminous coal or shale: 75 cents per ton of 28 bushels.

AMERICAN.

	Currency.
Westmoreland	$7 10 @— —
Fairmount Gas Coal Co. of N. Y.	7 00 @— —
Despard Coal Co	7 00 @— —
Penn	7 10 @— —
Newburg Orrel Gas	— — @— —
West Fairmount Gas Coal	7 00 @— —
AT PHILADELPHIA.	
Westmoreland	7 00 @— —

Prices of Foreign Coals.

October, 1872.

Duty 75 c. per ton.

Corrected weekly by ALFRED PARMELE, No. 52 Pine street, N. Y

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	12 00@13 00
" House "	19 00@20 00
" Orrel	14 00@16 00
Per ton 2,240 lbs., ex-ship.	
PRICES FROM YARD.	
Liverpool House Orrel, screened	$14 00@16 00
"Cannel, "	19 00@23 00
Per ton 2,000 lbs. delivered.	

Freights.—October, 1872.

TO EASTERN PORTS.	Cumberland. From Georgetown.	Cumberland. From Baltimore	Anthracite. From Philada.	Anthracite. From Ellis. Port, Port Johnston, and Hoboken.	Anthracite. From Newburgh.	Anthracite. From Rondout.
Amesbury						
Bangor		2 75		2 00	2 20	
Bath	2 75	2 75				
Boston	2 65	2 60		2 10	2 30	2 35
Bridgeport	2 25	2 30		1 10	1 25	1 25
Bristol				1 45	1 60	1 70
Cohasset Narrows	2 70					
Derby	2 50			1 25	1 40	
Dighton	2 35					
East Cambridge				2 00	2 30	
Fall River	2 30	2 35		1 45	1 60	
Hackensack						
Hartford	2 50	3 00		1 60	1 80	
Hoboken	2 00			55	60	65
Jersey City	2 09			55	60	65
Lynn						
Middletown						1 55
Mystic		2 75				
New Bedford	2 35	2 50		1 50	1 65	1 75
Newburyport	2 50	2 75		2 00	2 40	2 50
New Haven	2 25	2 30		1 10	1 25	1 25
New London	2 30	2 30		1 30	1 40	1 45
Newport	2 30	1 90		1 45	1 60	1 70
New York	2 10	1 90		60	60	65
Norwalk	2 50	2 60		1 10	1 25	1 25
Norwich	2 40	2 35		1 40	1 50	1 55
Pawtucket		2 65		1 55	1 70	1 90
Portland	2 70	2 50		1 90	2 15	2 30
Portsmouth, N. H	2 85	2 75		2 10	2 35	2 45
Providence	2 30	2 35		1 45	1 60	1 70
Rockport					$ c?	
Saco						
Sag Harbor		3 00		1 30		
Salem	2 70	2 75		2 20	2 30	2 35
Stamford				1 10	1 25	1 25
Stonington				1 35	1 45	1 55
Taunton				1 95	2 10	
Warren				1 45	1 60	
TO RIVER PORTS						
Albany	3 00	2 40				
Catskill						
Cocksackie						
Coeyman's						
Cold Spring	2 30	2 25				
Fishkill						
Haverstraw	2					
Hudson	2 30	2 30				
New York						
Nyack	2 25					
Poughkeepsie	2 25					
Rhinebeck						
Rondout						
Sangerties						
Sing Sing						
Stuyvesant						
Tarrytown						
Troy	3 00	2 50				
West Point						
Yonkers						

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, ifrom Schuylkill Haven for consumption ($1 85 less 55c. drawback	$1 30
For reshipment	1 75
MAUCH CHUNK TO ELIZABETHPORT.	
L. V. Railroad from Mauch Chunk to Phillipsburgh	$0 66
C. R. R., N. J., Phillipsburgh to Elizabethport	0 98
Shipping expenses at Elizabethport	25
Wharfage	10
Total	$1 99

MAUCH CHUNK TO PORT JOHNSON.

L. V. R.R., or L. & S. R.R. from M. C. to Phillipsb'g	$0 66
C. R. R., of N. J., Phillipsburgh to Pt. Johnson	0 98
Shipping expenses	25
Wharfage	—
Total	$1 99

TO HOBOKEN

L. V. R. R., Mauch Chunk to Phillipsburgh	66
Morris & Essex R. R. Phillipsburgh to Hoboken	0 98
Shipping expenses	25
Wharfage	—
Total	$1 99

TO SOUTH AMBOY.

L. V. R. R.	66
B. & D. R. R. / Cam. & Am. R. R.	98
Shipping Expenses	75
Total	$1 99

PENN HAVEN TO ELIZABETHPORT.

L. V. R R. Penn Haven to Phillipsburgh	0 70
C. RR. of N. J. Phillipsburgh to Elizabethport	0 98
Shipping expenses	25
Wharfage	10
Total	$1 99

Foreign and Provincial Freights.

October 1872.

Foreign.

Newcastle and Ports on Tyne, per keel of 21 1-5 tons £
Liverpool, 5 per cent primage

TO NEW YORK.

Provincial.	
Sydney	$3 05
Lingan	3 50
Cow Bay	3 75
Port Caledonia	3 10
Little Glace Bay	3 00

TO BOSTON.

Sydney	3 00
Lingan	3 00
Cow Bay	3 00
Port Caledonia	3 00
Little Glace Bay	2 90

MARKET REVIEW.

NEW YORK, Oct. 24, 1872.

IRON—The continued small stocks and general firmness of holders have caused a very quiet market for Scotch Pig, and no sales have been made in this market. At Philadelphia an auction sale of 961 tons Eglinton took place 21st inst., occasioned by the refusal of the purchaser to receive it, on account of its alleged poor quality, which resulted in its being sold in lots at the low price of $45a48,50. Fifty dollars had been offered on Saturday last for the whole lot, and $51,50 for a lot of 250 tons, both offers, however, being declined. In American we do not hear of any transactions, there seems, however, to be little chance for any great decline from our present quotations, on account of the continued scarcity of the No, 1 brands. New English Rails are very quiet at $73a74 gold, and American $85 at the mill in Pennsylvania, which is about the outside price. Old English Rails have met with more inquiry, but at prices below the views of holders. The stock is nearly 12,000 tons, largely concentrated, however, in one hand. Nearly 2000 tons have changed hands in this market at about $42a45, gold. At Philadelphia several hundred tons sold at $52 currency, for D. H.; and 1a2000 do., to arrive there, $53, time. Scrap is very dull, and with no great demand the market tends to buyers' favor. Considerable is being offered from dock, but buyers are not inclined to purchase at present figures; we quote from yard $49a50, and from dock $45, but these prices are to some extent nominal; sales 100 tons, ex ship, at $45, 60 days, without interest; and 3000 do., from dock, on terms not made public. Manufactured from store is without change. Refined is held firmly. Late telegrams from England quote the market as recovering from the temporary reaction of the first of the month. Russia sheet is in better supply, and sales have been made at 16½ cents for perfect, and 15 for No. 1 Stained, both gold.

PHILADELPHIA, Oct. 21.—(From Circular of Edward Samuel).—There is no change to note in Pig, all grades being dull. Pig is generally at this time of the year active, caused by consumers laying in the Winter's supply, but the high prices this year, and the general belief with buyers that prices will decline make the purchases sufficient only to cover immediate wants. Manufactured Iron unchanged.

LONDON, Oct. 10.—From the monthly circular of S. W. Hopkins & Co:—

EXPORT OF RAILS FROM GREAT BRITAIN.

	Month ending Sept. 30.			Nine months. ending Sept. 30.		
	1870.	1871.	1872	1870.	1871.	1872.
U. S. tons.	33,794	54,373	37,732	313,410	389,535	378,053
other countr's	8,737	7,942	6,666	46,559	59,403	52,283
Total	103,985	93,529	93,383	862,218	756,370	920,720
Old Iron to all Countries	9,416	17,864	10,058	85,771	109,629	85,805
Pig Iron to U States	9,650	12,963	16,602	84,711	132,061	168,933

LEAD.—Common Foreign is firmly held at $6,62½ gold, on the spot, and we hear of none offering at anything less; sales of a few hundred tons have been made at this price; to arrive, $6 50 is asked.

COPPER.—New Sheathing is steady at 43 cents, and Bolts and Braziers 45; Bronze and Yellow Metal Sheathing 27, and Y. M. Bolts 32, cash. Ingot is quiet, but the improved feeling before noted continues, and the market may be written firm. Sales have been made of 100,000 lb. Lake at 32½ cents, cash and short time; and 50,000 lb. Best Selected English 29a29½ cents. 25,000 lb. old Copper and 16,000 lb. old Brass and Composition sold on private terms.

SPELTER.—With favorable accounts from Europe, the transactions have been larger than before in several months, and prices tend upward; sales have been made of 300 tons Selesian at 6¾a7⅞ cents gold. Domestic is quoted at 9½ currency.

TIN.—The market for Pig, here, is very quiet, with the previous nominal quotations ruling, say, for Banca 38 cents, Straits 33¼a33½, and English 33a33¼, gold; 5 tons English sold at a private price. Rumors are current that 8a9,000 slabs Straits have changed hands in Boston, or bought on Boston account, but if such purchases have been made the particulars are well guarded. Plates remain dull, and prices are weak. Jobbing sales of the best brands Charcoal Tin have been made at $12,50a12,75 gold; 2000 bxs. Charcoal Terne, second quality, sold at $10 gold.

ZINC.—Mosselmann Sheet is steady at 9½ cents less 4 per cent. gold. Manganese block oxide 4 cents, do. Peroxide 5½.

METALS.

NEW YORK, October 24, 1872.

IRON.—Duty: Bars, 1 to 1¼ cents ₩ lb; Railroad, 70 cents ₩100 lbs.; Boiler and Plate, 1½ cents ₩ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ₩ lb; Pig, $7 ₩ ton; Polished Sheet, 3 cts. ₩ lb; Galvanized 2½; Scrap Cast, $6; Scrap Wrought, $8 per ton. All less 10 per cent. No Bar Iron to pay a less duty than 35 per cent. ad val.

	Store Prices.
Pig, Scotch—Coltness ₩ ton	60 00@— —
Gartsherrie	55 00@56 00
Glengarnock	54 00@55 00
Eglinton	52 00@52 50
Pig, American, No. 1	53 00@55 00
Pig, American, No. 2	50 00@52 00
Pig, American, Forge	42 00@47 00
Bar Refined, English and American	115 00@120 00
Bar Swedes, assorted sizes (gold	120 00@130 00

	Store Prices, Cash.
Bar, Swedes, 1¾ to 5 x ⅜ & ⅞ 2 sq. & 6 to 12 x ¾ & ½	145 00@155 00
Bar, Refined, ¾ to 2 in. rd. & sq. 1 to 6 in. x ⅜ to 1 in.	— —@120 00
Bar, Refined, 1¼ to 6 by ¼	125 00@— —
Bar, Refined, 2½ to 2¾ round 1 & 1¼ by ¼ & 5:16	127 50@— —
Large Rounds	127 50@140 00
Scroll	140 00@170 00
Ovals and half-round	140 00@160 00
Band	— —@135 00
Horse Shoe	130 00@140 00
Rods, ⅜ to 3-16 inch	125 00@165 00
Hoop	145 00@190 00
Nailrod	@ 9
Sheet, Russia, as to assortment (gold)	16½@ 17
Sheet, Singles, D. and T. Common	—7½@— 8½
Sheet, D. and T. Charcoal	—8½@— 9
Sheet, Galv'd, list 10 per cent, discount	—@— —
Rails, English (gold), ₩ ton	73 00@ 74 00
Rails, American, at Works in Pennsylvania, currency	85 00@— —

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 4 cents ₩ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ₩ lb	— @— 43
Copper Bolts	— @— 45
Copper Braziers, 16oz. and over	— @— 45
Copper Nails	— @— 45
Copper, Old Sheathing, &c. mixed lots	26 @— 28
Copper, Old, for chemical purposes, 14@16 oz.	— @— —
Copper English Pig	29 @— 29½
Copper, American Ingot	32 @— 32½
Yellow Metal, New Sheathing & Bronze	— @— 27
Yellow Metal Bolts	— @— 32
Yellow Metal Nails	27 @— 30

LEAD.—Duty: Pig, $2 ₩ 100 lbs.; old Lead, 1½ cents ₩ lb; Pipe and Sheet, 2¼ cents ₩ lb.

Galena, ₩ 100 lbs	$— — @— —
Spanish (gold)	— — @6 62½
German, do.	— — @6 62½
English do.	6 6¼@7 00
Bar (net)	9 25 @— —
Pipe (net)	— — @11 00
Sheet	— — @11 00

Colwell, Shaw & Willard Tin-Lined Lead Pipe 16½ cts. ₩ lb.

STEEL.—Duty: Bars and ingots, valued at 7 cents ₩ lb or under, 2¼ cents; over 7 cents and not above 11, 3 cents ₩ lb; over 11 cents, 3½ cents ₩ lb, and 10 ₩ cent ad val. Store prices.

English Cast (2d and 1st quality) ₩ lb	— 16½@— 20
English Spring (2d and 1st quality)	— 9½@— 10½
English Blister (2d and 1st quality)	— 11½@— 16
English Machinery	— 11½@— 13½
English German (2d an 1st quality)	— 11½@— 12
American Blister "Black Diamond"	— — @— 11½
American, Cast, Tool do.	— — @— 17
American, Spring, do.	— — @— 11
American Machinery do.	— — @— 11½
American German, do.	— 9 @— —

TIN.—Duty: Pig, Bars, and Blocks, 15 ₩ cent. ad val.; Plate and Sheets and Terne Plates, 25 ₩ cent.; Roofing 25. ad val.

	Gold ₩ lb.
Banca	38 @—
Straits	— @33½
English	33 @33¼

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ₩ box	$12 50 @12 75	$14 50 @15 00
I.C. Coke	11 50 @— —	13 00 @13 50
Coke Terne	10 00 @11 00	11 50 @— —
Charcoal Terne	11 25 @11 50	13 00 @13 25

SPELTER—Duty: In Pigs, Bars & Plates, $1.50 p. 100 lb

Plates, Foreign (gold) p. 100 lb.	6 62½@ 6 87½
Plates, Domestic p lb.	8¾@— 10½

ZINC—Duty: Pig or Block, $1.50 per 100 lb.; Sheet 2½c. per lb

Sheet per lb.	— 10 @ 10½

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, Oct. 24, 1872.

Our report from the San Francisco Stock Board is dated the 22d inst., without exception, the market has advanced. We have also appended the report of the 17th inst. showing the course of the market for the two dates.

		Oct. 17.	Oct. 22.
Savage	—	93	107
Crown Point	—	120	124
Yellow Jacket	—	88	92
Kentuck	—	—	220
Choliar Potosi	—	53	55
Gould & Curry	—	174	180
Belcher "New Issue"	—	88	91
Imperial	—	9¼	—
Raymond & Ely	—	134	130
Meadow Valley	—	28	27

American Institute of Mining Engineers.

OFFICIAL BULLETIN.

Announcements to Members and Associates.

I. The dues for the year ending May, 1873, are now payable. All members and Associates who have not paid their dues are requested to do so at once, by sending in postal orders, or checks, or money, ten dollars to the Secretary.

All members and Associates who pay their dues for each current year, strictly in advance, will have sent to their address, regularly and weekly, the ENGINEERING AND MINING JOURNAL, which is the organ of the Institute, and will contain the proceedings and transactions, and all important papers read before the Institute and all notices of meetings. Back numbers cannot, as a general rule, be sent.

II. It is expected that the more important papers read before the Institute, and the debates thereon, will be published in annual or occasional volumes to which those Members and Associates will be entitled who have paid their dues.

III. All authors of papers are requested to notify the Secretary in advance of the meetings, giving the subject and length of their papers. Attention is also called, in this connection, to Rules 12 and 13.

IV. The ninth rule has been amended, so that there will be hereafter three meetings a year, in February, May and October.

Wilkesbarre, Pa. MARTIN CORYELL, Secretary.

MISCELLANEOUS.

DROWN & CORLISS,

ANALYTICAL CHEMISTS,

AND

CONSULTING METALLURGISTS.

1123 GIRARD STREET,

PHILADELPHIA.

THOMAS M. DROWN. GEORGE F. CORLISS.

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POWDER CO., 21 Park Row, opposite Astor House, New York,

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BLASTING POWDER,

SAFETY FUSE,

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APPARATUS, &c.,

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THE

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Particularly devoted to the general trade interests of the country, has an established commercial circulation exceeding

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It has been the agent for the successful introduction to notice and sale of American productions in the countries named; and, by a steadily increasing circulation in that direction, has proven the most valuable medium for our trade interests abroad as well as at home.

Published Weekly and Monthly under the auspices of the

BOARD OF TRADE.

F. H. ROLLINS, 8 Church street, New York.

Oct.1.1.year

C. F. A. HINRICHS.

ESTABLISHED 1801.

Sole Owner and Dealer in the celebrated all-metal Saint Germain or German Study Lamps. Stachlen's Patent Lamps. These lamps give the steadiest and clearest light and are the safest in use, particularly suitable for Engineers' night work. Also importer of Fine Glassware, French China, Lava, Parian, Toys, Fancy Leather Goods, Clocks, Bronzes, Cutlery, Smokers' Articles, Masks, Looking Glasses, &c., &c.

29, 31, 33 Park Place,

Oct. 29:3m NEW YORK.

DEPARTMENT OF POPULAR SCIENCE.

The Relation of Agriculture to Civilization.

IN the Liberal Club, Friday, October 18, a very interesting paper was read on this subject. The speaker of the evening, ADOLPH OTT, Ph. D., was introduced by Mr. W. L. ORMSBY, Vice-President of the Club, formerly of the editorial staff of the *World*. Dr. OTT commenced by saying that he proposed to show that the rise and fall of nations had always been most intimately connected with the degree of fertility of the land inhabited by them. That the soil formed the seat and support of vegetation and animated life none would deny. Like the gold-bearing alluvium in the gold districts of California and Australia, so was the soil the final result of the action of powerful external agencies upon the rocks, and it required perhaps one thousand years to produce earth of one-tenth of an inch thickness, suitable for the growth of plants. Like the auriferous earth referred to, the soil of the field was by no means inexhaustible. That crops exhaust the soil is a fact demonstrated by universal experience and unless enriched with the same substances drawn from it, it would ultimately cease to afford to man the means of his subsistence. "History shows us in numerous instances that areas of land, formerly inhabited by powerful nations, mainly confined to agriculture, are at present not capable of yielding food to a scanty population. We have been taught to believe that the increase of nations is to be ascribed to peace, their decrease to war, emigration or epidemics. We know how well qualified this or that king or general has been to sacrifice lives, how successful he was in acquisition of territory, family aggrandizement and purposes of purely selfish ambition—we call this history; but the *history of the soil*, with which life is inseparable, we do not know."

The speaker then proceeded to cite a number of instances in proof of the truth of the foregoing assertions, which he said he owed mainly to that great work of BARON VON LIEBIG, "*Die Chemie in ihrer Anwendung auf Agricultur und Physiologie*," which unfortunately has not been translated yet.

What he stated about Spain was especially interesting. It is substantially as follows: Under the emperors Spain, the home of TRAJAN, HADRIAN, MARC AURELIUS, belonged to the wealthiest and most flourishing countries of the world. LIVIUS and STRABO relate of Hispania's fertility and the hundred-fold harvests of Andalusia. In every new campaign, reports LIVIUS, one found new arms, new treasures, as if no war ever had raged in that land.

Under the reign of ABD ERRAHMAN III., (912—961) the Mohammedan Spain sustained a population of from 25 to 30 millions; it was then the most populous country. Tarragona which was under the Romans the second city of the empire, had over one million inhabitants; under ABD ERRAHMAN III. 350,000, while now it has only 150,000! The city of Granada could then raise 50,000 soldiers, and, if we can believe the accounts of the Arabian authors with regard to Cordova, this city with its 212,000 houses and 600 mosques was not smaller in circumference than London in the beginning of this century.

Six hundred years after ABD ERRAHMAN, Herrara puts the following question in his book on Spanish agriculture, which appeared in the year of death of PHILLIPP II. (1598): "What may be the cause, that now-a-days the deficiency of food makes itself perceptible in the whole land, and that now in peace a pound of meat costs as much as a whole mutton in midst of war? Over-population cannot be the cause, for where a thousand Moors found employment, there is scarcely place for 500 Christians. It can neither be the importation of gold from India. Is it perhaps the soil which lies dormant? But the soil does not need any other rest than that of winter's sleep, and there was no want of winter rains to refresh it and to provide it with the force for the sprouting of seeds. What, therefore, is the cause, that the soil will not nourish us any more?"——HERRARA continues: "The mule is the cause. In the middle of the 13th century, it gained ground, since which time dates the desolation of Spain. It lacks the power to plough deep enough!"

With regard to the system of husbandry prevailing in the United States, the lecturer said that VON LIEBIG considered it the most reckless and exhaustive one existing, and he attempts to dispel the hope that they will ever become the granary of Europe. In 1856 the United States consumed 33½ million pounds of cereals more than in 1850. Supposing, says VON LIEBIG, that this enormous quantity had been exported, it would have provided Europe for only six days, and England, France and Germany for only two weeks.

With a few honorable exceptions, said Mr. OTT, I have nowhere met less acquaintance with the labors of the great investigators in agricultural chemistry, LIEBIG, BOUSSINGAULT, MULDER, KNOX, STOHMANN, PINCUS, &c., than in this country, and absolutely nowhere have I found less knowledge on this important subject than in the Department of Agriculture in Washington. In glancing over the ponderous yearly reports of this department, how often was I not surprised to learn, that the appropriations granted for agrico-chemical researches were expended in foolish experiments and that *none* of those volumes contained the least mention of those highly interesting and important investigations, which for a long series of years have been carried on in Germany.

The system, now in vogue in this country, was exactly the same which impoverished Italy, Greece, Spain, Portugal and the West Indies, to which we now export grain, but which were formerly the best grain-producing nations of the world. The day will come when our children will suffer from the errors of their fathers. No nation on earth, however powerful she may have been, has been enabled to exist unless she could preserve the fertility of her soil. In the words of the Scripture: "When thou tillest the ground, it shall not henceforth (at once?) yield to thee her strength; a fugitive and a vagabond shalt thou be in the earth."

Dr. OTT then gave a description of the system of husbandry in Japan and China, as known to us by the writings of HEDDE, DAVIS, FORTUNE, MARON and others.

He said we could learn a good deal from the inhabitants of those distant countries as it was now agreed upon by competent men, that they were ahead of us in matters of agriculture. They know how to keep the soil productive, and one important reason was that they were unacquainted with the system of sewerage. The matter allowed to escape in the sea elsewhere, was considered by them the most valuable fertilizer. After having compared in many details the system of husbandry practiced in China and Japan with that of Europe and America, he concluded his highly interesting lecture. It was then discussed by Dr. DOTCH, formerly Secretary of the Board of Health in Washington, Prof. P. H. VAN DER WEYDE, D. T. GARDNER, the active Secretary of the Club. Mr. DUGDALE, Dr. HALLECK and WM. L. ORMSBY.

The Breaking of Rails.

Though the effect of cold upon iron is not yet fully decided there are direct experiments which go to prove that iron does not, as popularly supposed, become more brittle or in any way lose its strength from lowering its temperature. That rails break oftener in winter than in summer, and in cold countries more than in temperate ones, seems to be undeniable, M. CARON, a French gentleman, who has investigated the subject, thinks that good iron is not affected by frost, but that poor iron does suffer loss of strength. He points out another cause of rail-breaking in the diminished elasticity of the road bed when the ground is frozen. He says: "Again, most railroads are far more elastic in summer than in winter, owing to the increased hardness of the ground and ties in winter. If a rail is raised beyond the grade lines, by a tie which has been elevated by the action of the weather upon the road bed, and a locomotive strikes it with a blow of twenty-five tons at a point where it must find a bearing, the natural effect of that blow would be to break the rail, whether there was frost in it or not. So it is evident that the great rigidity given to roads in cold weather is a better reason for breaks than mere frost." This is certainly a sensible conclusion and has the merit of offering us an explanation of the breaking of rails in winter which is possibly within our control. A new system of track-laying or of constructing the permanent way may be found which will reduce the number of broken rails. A comparison in the breakages in the different countries might afford evidence for or against M. CARON'S hypothesis, by showing the percentage of broken rails on tracks laid according to the systems in use in various countries.

According to the London *Economist*, during the past ten years the export of gold from the Australian colonies has not been less than 17,000,000 ounces, or about $340,000,000, and the gold coin export has been about $100,000,000. During the ten years preceding this time, the export of gold was about equal to the above figures. If this is correct, the total export of gold from these colonies since the first discoveries of the diggings, cannot have been much less than $900,000,000. The yield of California during a like period is estimated at $600,000,000, giving a gross total from these two important repositories of the precious metal of $1,500,000,000 added to the wealth of the world since 1852.

A 538 oz. gold nugget was lately found in Australia. It was in the wall of an old trench that was cut about nine years ago, when a large number of men were at work in the locality. The successive rainfalls had, with the continuous washing and crumbling away of the soil, brought this handsome little fortune into daylight to be dropped upon by a hard-working miner named Davey, who was passing by, and, seeing what looked like a speck of gold, he applied his pick, and knocked out his long-sought pile.

A WESTERN gentleman proposes to ventilate mines by means of a tube, a can of water and an alcohol lamp. The pipe runs to the heading, the lamp is put under the can, and for the rest we are told that "the water, becoming boiled throws off steam, causing a vacuum." We agree with a cotemporary who declares that "if the principle is scientifically correct there is but little doubt that its application will be beneficial to mines generating foul air!"

Mr. E. F. R. LUCAS, of Penn Fields, England, has patented an invention for "the coking of pitch." The invention consists, first, in the production of a pitch coke of good quality, by subjecting the pitch in a muffle oven to the influence of the flame, heat, and gases evolved from the fuel employed; and, secondly, in the manufacture of chrysene and anthracene from coke oil or pitch oil.

THE annual value of iron manufactured in this country is $900,000,000; the wages of labor engaged upon it must exceed $600,000,000; and the number of workmen employed in it is 940,000. Allowing the usual numbers to the workmen's families, one-tenth of the entire population of the United States is seen to be dependent upon the production and manufacture of iron for support.

A new steam rock drill, which is capable of boring a hole eight inches in diameter, has just been introduced in the antracite regions by the Pennsylvania Coal Company. It will bore further in one day than a dozen men with the old drills could drill in a month.

Large quantities of iron ore have been found in Maine, which it is proposed to open up in order to furnish iron for the New England market.

The Irish bogs now have a rival in a coal bed of very considerable dimensions recently discovered at Carri Ganulla, County Kilkenny.

An English company, with large capital, has been formed for the purpose of constructing smelting works at Denver, Colorado.

THE ENGINEERING AND MINING JOURNAL.

ROSSITER W. RAYMOND, Ph. D.,
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THE amount of the loss by the fire at the Cambria Iron Works dwindles down from that first reported to only $40,000. Fires seem to be looked upon as blessings in Johnstown. It is usually difficult to demolish old works in the midst of a good business, however inconvenient or confined they may be. But fire has twice cleared the ground in the Cambria Works, and we have no doubt the result of this last disaster will be as fortunate as that of the first. Then enlarged and improved works rose on the ruins and with the new furnaces already projected, the Johnstown men will probably point to their second fire as marking the beginning of a second era of great expansion.

Train Throwing.

If we may judge by frequent reports in the daily press of attempts to throw railway trains off the track, this species of villainy has become almost epidemic in this country. Obstructions have in numerous cases been found on tracks, and evidently placed there by design. But the acme of this fearful kind of murder was reached in the effort to throw off an express train near Steamboat station on the Pennsylvania road, and in an other, the scene of which was laid at the high bridge on the Delaware, Lackawanna and Western road, near Paterson, N. J. The bridge tender was gagged and bound by six men who then wedged large stones between the rails in such a way that the train must have been thrown off. The result at that point cannot be doubted. Fortunately the track surveyor came up, removed the obstructions and freed the bridge tender, but the perpetrators of the rascality were not to be seen. Travelling by rail is dangerous enough at the best, but if we are to have assassination added, the railway companies will have to devise means of protection.

The Pittsburgh Meeting.

The sixth regular meeting of the Institute held at Pittsburgh, Pa., on the 16th and 17th of October, 1872, a full report of which is commenced in our columns this week, derived additional interest from the present prosperous condition of the iron trade, which is so largely represented in Pittsburgh, and from the meeting of the American Pig Iron Manufacturers' Association, held in that city on the 16th, which adjourned just before the first session of the Institute. The President of the latter body was invited to address the Pig Iron Association, and responded with an earnest appeal for coöperation between the two societies, and for the active support of the practical manufacturers in advancing the sciences upon which their business depends. The sessions of the Institute were largely attended by gentlemen engaged in various branches of the iron business; and many of them were elected as members or associates. It may be said that, on the whole, no previous meeting of the Institute has been attended with greater present interest or promise of future growth and usefulness. In two branches of our profession at least, the mining of coal and the metallurgy of iron and steel, the influence of this young and vigorous society is already felt, and likely to be powerful for good. We look forward with confidence to see its activity potent in other fields as well.

Railroads in Utah.

UTAH seems determined to maintain the railway advantages which have been so profitable to her. The valley of the Salt Lake runs southward from that body of water sixty miles or more, and by other parallel valleys which form its continuation, there is a valley route to the Mexican line. But for present purposes it is sufficient to confine ourselves to the Lake Valley. From that great thoroughfare mountain cañons run to the right and left, which within three years have become famous as great mining centers. Big and Little Cottonwood, American Fork, Spanish Fork, Bingham and other cañons all debouch into the great valley. The Utah Southern Railroad runs southward from Salt Lake City through the Lake Valley, and narrow-gauge roads are now building from this trunk line to Bingham and American Fork. But it is remarkable that the most celebrated of all Utah's cañons—Little Cottonwood, where lies the Emma—has no railway and depends solely upon a wretched road, a disgrace in a country which affords such specimens of mountain road making as Nevada possesses, and a constant hindrance to mining. Since railroads are clearly necessities to Western mining and the very handmaids of their prosperity, it is a subject for much wonder that the great interests established in that cañon have not yet combined for the construction of the much needed railway. It is true that the snows would prevent its use during a full half of the year, but that is all the more reason why the means of transportation during the season of activity should be of the best. It is true that the grades in Little Cottonwood must be high, but to overcome them is a task not beyond the resources of modern engineering.

As for the rest, the Salt Lake Valley with its branching cañons forms one of the simplest and grandest systems of arrangement that occur in our country. From the main line the distance to the mining camps is from 15 to 25 miles, and though the grades are heavy, and winter will be a season of blockade, the railroads can be built and will form an element in what promises to be a magnificent development of mining wealth. It is more than probable that rich cañons lie south of those already known, and the Utah Southern may be able to lengthen out for a hundred miles through a line of cañons, which in the aggregate will present an accumulation of mineral wealth comparable to the great fields of Saxony, the Hartz Mountains and the Rhine.

NEW PUBLICATIONS.

Underground Treasures: How and Where to Find Them. By JAMES ORTON, A.M., Professor of Natural History in Vassar College. Hartford, Worthington, Dustin & Co. 1872.

THIS little work is intended, as the author declares, not as a manual for mineralogists, but as a help to farmers, mechanics, miners and laborers, in the discovery and preliminary examination of useful minerals; in other words, "to furnish a key for the ready determination of all the useful minerals within the United States." In the execution of this plan, Prof. Orton has, first, rejected all mineral species not valuable in the market or applicable in the arts; and secondly, he has classified the remainder with reference to hardness, opacity, and color. Thus he makes two main divisions, A, those which will scratch glass, and B, those which will not scratch glass. Under each of these he makes two classes, I, the opaque, II, the translucent minerals. Finally, under each of these heads there are subdivisions according to color; and in each of these subdivisions there are several species, designated by numbers in the key, among which the observer must make further comparisons, before deciding upon the specimen he is studying. Class B, by the way, is incidentally divided into minerals harder and minerals softer than white marble.

There is no pretence that this classification is scientific; yet it is not more arbitrary than the Linnean system in botany. Both of them are like the arrangement of letters in the Post office, the sole justification of which is the fact that it enables people to find the letters. If they want to know what is in them, they must go further.

We inquire then, with respect to Prof. ORTON's key, how quickly and surely it will lead to the identification by an unlearned person of any useful mineral. The tests proposed are all simple and easily applied. The characteristics of hardness and opacity are tolerably permanent; and that of color, though subject to variations, may still be employed with due caution as a means of determination. When we come to the ultimate groups, we find that their heterogeneity, which indicates unscientific classification, really facilitates determination to a remarkable degree. Those systems which recognize and follow the affinities of nature group together the species which most nearly resemble each other. Hence the final distinction of species is the most difficult of all.

The advantage of an arbitrary key, on the other hand, may be shown by an instance taken at haphazard from this manual. Suppose we have in hand a red mineral, opaque, softer than marble. By the key we find that it is one of four minerals—namely, cinnabar, copper, red iron ore, or ruby silver. These four have no real connection with each other, and for that very reason it is easy to tell which of them is before us. Ruby silver, by the way, ought not to be called opaque; it is translucent in a strong light; but the unlearned observer may take it for opaque, only, if he does, he will also take it for black instead of red. This difficulty Prof. Orton has met by simply putting it under red and black translucent as well as red and black opaque.

In addition to this useful key, the book contains practical directions about prospecting for diamonds, gold, silver, copper, lead and iron; about assaying, mineral springs, artificial jewelry, etc.

We notice on page 93 a typographical error, by

which the author is made to say that the minimum profitable percentage of silver in a silver ore is one two-thousandth per cent., of platinum one ten-thousandth per cent., and of gold one hundred-thousandth per cent. The *per cent.* in these cases should be struck out. One hundred-thousandth (or one thousandth of one per cent.) in gold is about $5 per ton, which is quite little enough to be a minimum for paying quartz.

Tyndall's American Lectures.

THAT the expectation of pleasure and profit from the course of lectures which Prof. TYNDALL is now giving in Boston, and which he will repeat in Washington, Baltimore, Philadelphia and New York, is not likely to be disappointed, will appear from the following careful analysis of his theme, Light, as he has arranged it for six nights :

He begins in a prefatory way, and dwells upon the introduction of the experimental method into Science. Speaks of the ardor of investigators and of their rewards. He seeks to show that most of them wrought for the sake of *knowledge*, and with no practical end in view, though their discoveries travelled to the most astonishing practical applications. After dwelling on the importance of original inquiry, he takes up the real subject of the lectures. The instruments are explained, and the principles upon which they depend. He points out the proximate cause and action of the electric light which is to be used in the illustrations. The laws of reflection are demonstrated, and one or two striking practical applications adduced. Then he goes on to refraction. These elementary subjects are really touched upon in order to enable him in a subsequent lecture to reveal the workings of NEWTON'S mind when he theorized upon the subject of light. Refraction is followed by an inquiry into the constitution of light, its analysis and synthesis. This occupies the first lecture.

In the second lecture the demonstrated constitution of light is applied to the doctrine of colors. He goes very thoroughly and plainly into this matter, making perfectly evident the causes on which ordinary colors depend ; winding up by the experimental proof that yellow and blue light, when mixed together, produce *white* and not green. Having exhausted the ordinary spectrum, he describes the difference between the emissions from solids and their vapors. Metallic vapors are produced and shown with their characteristic colors. Their light is then analyzed, and it is shown to be distinctive of the substance from which it comes. Spectrum analysis is dwelt upon and copiously illustrated.

In his third lecture TYNDALL deals with solar light, dwelling upon the distinction between the bright lines of the metallic vapors and the dark lines of Fraunhofer. The reciprocity of radiation and absorption is demonstrated, and it is shown experimentally that an incandescent vapor absorbs the light which it emits. This leads up to the theory of the physical constitution of the sun. Then he goes on to show the extension of the spectrum beyond its visible range, performing with quartz prisms and lenses Stokes' experiments on Fluorescence, and the rendering visible of invisible rays. Then the other side of the spectrum is handled ; its extension as *heat* beyond the limits of light is demonstrated. Numerous experiments on the *total* heating power of the rays from the electric light are made ; fusion and combustion being thus effected. Here he hopes to perform the famous Florentine experiment of the ignition of a diamond in oxygen, using, however, a purely terrestrial source of radiant heat. He also hopes to produce combustion by rays concentrated by a lens of *ice*. The heat rays are then filtered from the light rays, and it is shown that all the foregoing effects are produced by rays totally beyond the range of vision ; fusion, combustion and explosion being produced at foci perfectly dark, and, as far as the air is concerned, perfectly *cold*. It is also proved that these dark rays perform the work of evaporation n the tropical ocean, and the work of fusion upon the Alpine ice and snows. The rays, mereover, are shown to be competent to raise platinum to a white heat, so that by its intervention you may extract from the dark rays all the colors of the spectrum. This brings him to the end of the third lecture.

In the fourth lecture he shows the irresistible tendency of the human mind to seek for governing principles which rule facts and correct them, rendering them, so to say, organic. He dwells upon the exercise of the theorizing faculty, taking Newton as an example. He tries to show how naturally his optical theory grew out of his previous knowledge. The doctrine of colors is now extended by the introduction of the colors of thin plates, of striæted surfaces, &c., and he unravels the subtle additions which Newton made in his theory in order to fit it to these new facts. The theory of emission is then contrasted with the theory of undulation. The latter is rendered familiar to the mind by preliminary considerations regarding water waves, and by experiments regarding sound. He dwells upon the labors of Thomas Young and the effect of Brougham's attacks in the *Edinburgh Review*. This will be his most difficult lecture, but he has wrought hard to make it clear, and it is essential to the comprehension of the subsequent ones.

In the fifth lecture Tyndall enters upon the phenomenon of crystallization, and seeks to give an intelligible explanation of crystalline architecture. The process of crystallization is experimentally illustrated. This is done with a view to the action of crystals upon light. In the first experiments he deals with crystals solely with reference to the polarization of light. This is explained and illustrated by numerous experiments. Double refraction and the state of the two halves of the divided beam are dwelt upon. Then come the chromatic phenomena of polarized light. Basing himself upon the principles explained in the fourth lecture, he hopes to make these effects comprehensible by all intelligent persons. The effects of mechanical strains and pressures in producing a quasi crystalline structure are exhibited. Then the similar phenomena of unannealed glass. He hopes to show these effects in a very splendid fashion. They will more than fill the fifth lecture.

The sixth lecture is devoted to the further illustration of the action of crystals upon light ; uniaxal and biaxal crystals, circular polarization, and the chromatic effects produced by rock crystals ; the conferring of double refractory power by sonorous vibrations ; and the magnetization of light. Although the syllabus is short it covers a good deal.

We have sketched the course of six lectures. The materials touched upon are ample [to fill the six to overflowing, allowing an hour and a half for each lecture. A seventh very striking lecture might be given, he says, on the identity of light and heat. Every experiment made in the optical lecture being shown capable of repetition with pure lightless radiant heat ; the thermo-electric pile and galvanometer being substituted for the eye. He has made an arrangement for the projection of the galvanometer dial upon a screen which renders it visible to any number of people.

As he worked at the subject the desire grew upon him to do it more and more thoroughly, and to spare no expense as regards apparatus. He has accordingly purchased between three and four hundred pounds sterling worth of new instruments ; and has gone over all the experiments so as to render everything sure, and in a manner worthy of the subject and of the occasion.—*U. S. Railroad and Mining Register.*

Successful experiments have been recently made in England with a new Railway Brake, worked by electricity. The invention consists in the application of electro-magnets, exerting a force of 600lbs., to pulleys on a swing shaft underneath the carriages. By merely pressing the key the guard is enabled to bring the train to a standstill.

American Institute of Mining Engineers.

CONTINUED FROM PAGE 275.

or a temporary success. The future is to be controlled.

The American iron master should plan, construct and manage, as if the barest profit that rewards capital and labor were his ; as if he were assailed on all sides by the fiercest competition at home ; as if he had to seek the market of the world for his living, and find himself opposed to the product of all nations and countries.

To build up a business that will be permanently successful, that will grow with our nation's growth and strengthen with her strength, we must put ourselves in a position to make as good an article, and sell it as cheaply as any other people can or will, and anything short of this is practically failure.

To accomplish this, we must summon to our aid three assistants — science, mechanical appliances, and contented labor. Those three are so closely connected, that take one away and the others are paralyzed.

The time has come when scientific research is to assume its true position—the day of "sheer force and blind stupidity," whose only protection was a high tariff, has gone by forever. The prodigal waste of the rich gifts of nature ; the vast sums of money thrown away ; the hard labor, in the aggregate too large to be even approximately estimated, which has been uselessly expended ; the mishaps, drawbacks and failures which have followed every step of our business, show most conclusively that the physicist, the geologist and mineralogist, the chemist, the engineer and mechanic are as essential to success as the furnace itself, or the labor that works it. They teach us how to apply the laws of air, and heat, and power most advantageously, where and how to look for our raw supplies, what they are worth to us when found, how to admix them to produce the most economical and profitable results, how to extract them from the earth, and transport them at least expense, how to take them from crudeness and unproductiveness to the thousand forms of use and beauty.

There is no merely practical man, no matter how varied may have been his experiences, or how long his practice, that will not be benefited by the results of scientific investigation. That there is a growing sense of the importance of having thoroughly prepared scientific men in every department of business is evinced by the institutions that are springing up in different quarters, provided with able teachers, most complete apparatus and models, and, significantly enough, splendidly endowed by men, who while achieving success and acquiring wealth without the advantages of a scientific education themselves, are giving to others those advantages which they could not themselves enjoy.

While our country has lacked these opportunities scores of young men have availed themselves of the facilities afforded by the admirable schools abroad, and have come home accompanied by thoroughly educated foreigners, attracted by the growing prosperity of our country, to offer their services, while America is preparing her own sons for her future needs. It should be alike the duty and pleasure of the trade to recognize their abilities and liberally sustain them in their high and honorable calling.

Before coming to our second assistant it may be observed that the location of a blast furnace must be governed by circumstances. Convenience of supplies and accessibility to market usually determine this point.

Ores bear transportation for a greater or lesser distance, according to purity and richness, without loss, as does pig metal. Fuel suffers materially by handling, carriage and storage. The loss by abrasion and breakage is much larger than is generally supposed, while recent investigations have demonstrated that all fuels suffer a loss of carbon by exposure ; especially with bituminous and semi-bituminous coals,

is the loss heavy—an exposure of only two weeks causing a loss of carbon to the extent of from ten to twenty-five per cent. The carriage of limestone should be avoided as much as possible, thereby saving expense on slag. The true rule is to pay freight on the manufactured article, and not on the raw material.

The supplies and the knowledge of how to save them being obtained, the next consideration is the furnace and its appliances.

The contrast between the furnace of to-day and the type of only ten years ago is astonishing. Light and graceful structures of iron have taken the place of huge and expensive masses of masonry; compact, durable, direct-acting engines have superseded acres of machinery; a simple arrangement of pipes and flues replaces the complicated system of olden times; ingenuity has been successfully taxed in devising methods for heating the blast to high temperatures, thereby economizing fuel, increasing the yield and improving the product; careful scientific and experimental investigation has so modified the interior lines of the furnace that the gases act with a uniformity and effectiveness in the reduction of the materials utterly unknown a few years since; closed tops control the hitherto waste gases to the useful purpose of generating steam and heating the blast; simple and ingenious devices raise the stack to any height, determine accurately the materials supplied, calcine the ores and limestone and break them in suitable size, properly prepare the fuel, and day or night, without rest or cessation, perform the work of an army of men.

The manufacture of iron may be robbed of very many of the uncertainties which have characterized it in the past. With duplicate engines of greater power than ordinarily required, a steadier blast can be obtained, and in event of an accident to one, the other can be temporarily taxed to take its place. A reserve of boilers and hot blast stoves permits cleaning and repairing without the furnace standing idle, and every iron master knows too well what a stoppage of twenty-four hours costs him; height utilizes the gases in the reduction of the ores and economizes the fuel—the larger the bosh, the larger the yield and the cheaper the product—the wider the throat and bigger the flues, the more readily the gases pass off.

Of course these general features must be modified to suit particular ores, and different kinds of fuel.

To do all this, money must flow like water—in the usual sense of the word, there can be no such thing as economy in the construction of the blast furnace. Whatever is proved to be the best adapted for the particular purpose to which it is to be applied, must be adopted, regardless of cost. In our case "to be penny wise is *not* to be pound sure," and a furnace is one of the exceptions which prove this rule. Whatever can be done by machinery, let machinery do, for *it* at least is insensible to Fourth of July's, Washington's birthday, political meetings, pay days and whisky.

The most unreasonable, unreliable, crankiest, and most troublesome machine is the human machine; and this brings us to our final assistant, labor.

In treating this, we at once get upon most delicate ground.

The labor question is one of the great unsolved problems of the day. How to manage it—to determine its proper relations to capital—to render it efficient, satisfied and productive, are questions which wise and good minds everywhere are anxiously seeking to answer.

That capital and labor should not be antagonistic is a truism, but a truism very difficult to apply to everyday life.

It is quite impossible on an occasion like the present, to discuss at any length the various bearings of a question so full of interest, and so potent in its consequences. All that will be attempted, will be to present most briefly the views of the writer formed as the result of observation, considerable personal experience, and a good deal of reflection. They are advanced with diffidence, as they may be widely at variance with the opinions of those better calculated to form wiser conclusions.

At the outset, then, let a sympathy and confidence be established between the master and his men. There is something more to be done, than exact the full hours of service, and pay the wages therefor—there is a kindly feeling to be created—a sense of mutual interest to be aroused—a sentiment of fellowship to be developed. To make a thoroughly good workman, we must make him intelligent; to make him contented, he must be able to comfortably support his family, and lay by something for a rainy day; to make him sober and moral, while being decided, we must appeal to those better feelings, often covered up and dulled, but rarely entirely absent. In pursuing such a course, many discouragements will be encountered; the motives may be misconstructed; ingratitude may oftentimes be the only return, but in time the effect will be produced.

It must be remembered that a very large number of working men are imperfectly or not at all educated. Many of those coming to us from the old world have been led to believe that their masters are their natural enemies, to whom they are to give as little, and from whom to take as much, as circumstances will permit; their impulsiveness and credulity often make them the willing tools of some of their own class, who, with, a smattering of knowledge, are generally wiseacres, impracticable and dangerous—never wise, and rarely useful; their just demands are often needlessly refused, their unjust ones not met with sufficient firmness. Working men, as a rule, are more prejudiced than unreasonable—more suspicious than malicious—much more easily led than driven—convince them that an appeal to the master will be met with consideration and fairness, and they will make the appeal before they strike—let their employer gain their confidence by impartiality and kindness, and if he can give a good reason for refusing their demands, they will suffer much before coming to an open rupture.

Their life at best is an unenviable one—their toil is incessant—their homes in many cases miserable—their improvidence prevents accumulation; deprived of work, by sickness or otherwise, their households suffer—if they die their families are thrown upon the charities of the cold world.

Let us masters be philanthropists, as well as money makers. By becoming benefactors to those under us, we will make them better and happier, more attentive and more profitable, and in addition to the larger return from their better labor we will reap the most satisfactory reward of an approving conscience.

Another important point is to make labor intelligent. Most excellent practical results are reached by workmen without their having the least idea of how or why they are so. In the blast furnace, where so much depends upon the accuracy and attention of the hands, if they could understand even in a general way, *why* they should do thus and so, they would save themselves much labor and oftentimes injury, their employers loss, and take away from the business many of its drawbacks. The simplest knowledge of the effect of heat, of blast, and of the nature of materials is usually wanting, and the "rule of thumb" being the only guide, the result is whatever good or bad luck may happen to bring.

For the present generation the only method of mental improvement would be by night schools, with a series of lectures. Discarding technical terms, and using only the simplest language, with such diagrams as could readily be drawn upon a blackboard, a vast deal of most useful information could be imparted, and by allowing and, indeed, inciting questions, many points, misty and unsettled, could be made plain and firmly fixed in the mind.

For the future, a class of reliable furnace men may be made by taking bright, industriously disposed boys as apprentices, and just as in other trades, good workmen may be built up.

By supplying a comfortable, well-lighted and regulated reading room, where men may gather after their work, find the papers and journals of the day, and especially the industrial and mechanical publications, and enjoy the opportunity of talking together, or amusing themselves in an innocent manner, not only may many hours be snatched from grosser pursuits, and the disgusting associations of the grog shop and gambling saloon counteracted, but a wholesome influence may be exerted in rendering the manners less rude and boisterous, the mind more susceptible to reason, and the desire for improvement more intense.

By all means, if possible, workmen should be attached by local interests. The class of men most difficult to control are single men; they have no local attachments; one place is as good as another; a desire to see the world, as they call it, makes them restless, and upon the slightest provocation they leave. On the contrary, a man with a family dependent upon him dislikes change—he cannot afford to lose time, and a natural desire is present to save something for those he may leave behind him. The strongest hold that can be had on a laboring man is to make him the owner of his own home in the vicinity of his work. Besides securing steady men, the employer is thus largely relieved from the necessity of providing houses and more profitably employs his capital in his business. The formation and proper conduct of mutual building and loan associations, where circumstances will permit, should therefore be encouraged.

Sickness or disability is the greatest misfortune that can come to a laboring man. His income is cut off, medical attendance is expensive, family expenses run on, and when he once more goes to work he is burdened with debt and harrassed with care; if honest, he struggles along under a heavy weight; if not, he steals away as the easiest way of paying a debt, often taking his first step in dishonesty, which he is apt to repeat for a less potential cause, and each time with greater ease, until he becomes a scamp himself and by his example makes scamps of others. The establishment of a hospital and pension fund in which the master takes a liberal share and interest makes a workman contented, because he can look forward without dread to sickness and old age. The benefit being lost if he voluntarily leaves, or for good cause is discharged, is a strong incentive to duty.

The co-operative plan, whereby the workman is entitled to a certain share in the profits of the business, is of recent adoption. In many instances it is working well. It is, however, so dependent upon the peculiarities of a business that to lay down any rule of action is impossible. Where workmen alone have attempted it the result has oftentimes been a failure, owing to lack of proper commercial education, diversity of opinions, and want of vigor and unity. Where the master has retained the general direction and simply divided a proper proportion of profit, success has usually followed, strikes are avoided, good men are attracted by such a partnership, and self interest prompts them to work well themselves, and to watch that their fellow workmen do their duty.

The calling of an iron master is more than interesting. We wage a Titanic warfare with nature, compelling her to relinquish from her tenacious grasp those varied treasures which, through countless ages, she has hidden away within her deep recesses. We summon to our aid all that science can afford, mechanical ingenuity devise, money purchase, and energy and ability achieve, and when this is done, we must fain confess how little we have accomplished, and how little we know compared with the vast possibilities that lie before us. Our occupation is fascinating because so uncertain. It demands the most careful attention, the nicest accuracy, the most incessant watchfulness, the boldest expedients, the strongest nerve.

We may not make the best iron that is produced, but it is our own fault if we do not make the *best*

product that our materials will admit of, at the smallest possible cost and at the largest possible profit.

A patriotic Virginian once declared that "Eternal vigilance was the price of liberty." In these more utilitarian days, we may truthfully and feelingly exclaim: "Eternal vigilance is the price of pig iron."

(TO BE CONTINUED.)

MINING SUMMARY.

Nevada.

From the Reese River *Reveille* of October 12.

REESE RIVER.

MORGAN AND MUNCY.—No new work being done. Good ore continues to come from the 300-foot level, and the ledge looks well.

SOUTH AMERICA.—But little doing beyond keeping the water out of the mine and some prospect work.

SAVANNAH.—The fine hoisting works of this company are completed and running and the shaft is being pushed vigorously with three eight hour shifts. Two ledges have been cut by the shaft. The last one was tapped this week and looks splendidly. The ore is composed chiefly of ruby and stephanite, and is of high grade. Things look decidedly encouraging here.

STAR OF NEVADA.—Work is temporarily suspended on the tunnel of this company; nothing is being done on either one of the ledges.

LONE STAR.—Sinking an incline from the 127-foot level and getting first rate ore.

ISABELLA.—The Ogden incline is being pushed rapidly; good ore coming from the O'Connell ledge; new lease let on the Isabella ledge. 25 men at work.

KING ALFRED.—The shaft of this company is being sunk as fast as possible, day and night. An accident has caused delay in the erection of steam hoisting works—wagon wheel broke, dumped the engine unceremoniously down the hill, and smashed it into the shape of a dilapidated slouch hat.

GROVE TUNNEL.—Messrs. Kane & Ludolph, lessees at the 200-foot east level, have a fine ledge, are getting elegant ore, and have about 15 tons of high grade rock on hand. Messrs. Hopley & Co. also have a lease in the same level, and are getting fair ore. Messrs. Canaley & Co. have a lease in the 250-foot level and have good ore in sight. The entire mine looks splendidly.

WHITLACH UNION.—Breasting in the ore chamber continues; nothing else doing.

SAYBROOK.—This mine looks about the same as at the time of our last report which was first rate.

OREGON SHAFT.—An increased quantity of ore is being raised from the vast caverns, the almost endless ramifications of which penetrate the prolific entrails of Lander Hill. The mines are reported as still in fine condition.

SHERMAN SHAFT.—The extensive works are shut down.

SARATOGA.—Working at both the east and west 340-foot levels; good ore coming from both, much of it being two thousand dollar rock. Messrs. Zandel & Co. have a lease at the 100-foot level. Two men are employed at the mines; several tons of high grade ore on hand.

ILLINOIS.—Work is suspended on this mine.

NORTH RIVER TUNNEL.—Still drifting for the Sunnyside ledge, and working on the North River.

IOWA TUNNEL.—A marked improvement is reported here, and all parts of the mine are turning out considerable quantities of high grade ore. All the leases held on this mine are proving valuable ones.

BEN BUTLER.—Closed up.

LANE & FULLER (Pacific Co.)—This mine, which, since our last report, has not been looking as well as usual, is improving again. The number of men employed has been reduced. There are about sixty tons of assorted ore in the ore house.

FREEHOLD.—Struck another ledge this week and water with it, which prevents sinking further without machinery. Steam works are to be put on. Meanwhile the shaft is being enlarged to a double one, and preparations made for active and efficient operations.

YANKEE BLADE.

KLING & KELLEY.—Driving the main drift ahead. The drift is now in 300 feet, running the whole distance on the ledge. There are four leases in different parts of the mine; all are getting good ore and the mine looks well. They are running night and day, have a good deal of water, and employ fifteen men.

ENSIGN & SOUTHALL.—Sinking a new shaft on the Valeria mine; now down 70 feet, but have not cut the ledge yet, rock hard.

VIRGINIA.—O'Kane is still driving ahead with the tunnel, which is now in about 300 feet. It will have to be driven about 200 feet yet before the ledge will be reached; rock hard; working two shifts.

PATRIOT.—The force of men on this mine has been considerably increased. The mine is reported as being in fine condition and sending up considerable quantities of good ore. We could not get full particulars of what is being done here.

STONEWALL.—Bowers & Gill are still at work in this mine, and are getting some good ore.

CHASE.—This mine is reported looking well. Three leases have been let, but the Judge, whom we interviewed to get these items did not know any details of the workings.

MORRIS & CABLE.—Work continues at the Morris and Cable, but we failed to get further particulars. We will seize upon the first opportunity to ascertain them through Captain Trask, the Superintendent.

BELMONT.

MONITOR CO.—Still driving tunnel No. 2 with three shifts of men. Taking out considerable fine ore from south incline. The Monitor mill machinery is nearly all placed, and ready to attach the belts, some alterations yet to do on the building and furnace, when the mill will be ready to steam up. Working on mines and mill sixty men.

EL DORADO CO.—Have just received three large loads more of mill machinery, upon which carpenters and machinists are busily engaged refitting and remodeling. It is the intention to make the El Dorado mill second to none in the State.

BELMONT CO.—Doing most of their work on Canfield mine by contract, as well as that in Highbridge mine, doing mostly dead work. Working twenty-five men.

COMBINATION MINE.—Doing as well as ever, a large lot of ore has been shipped to the Manhattan Mill at Austin. Professor A. N. Garvin is now in Austin attending to the milling of it. Big returns are expected. Working 20 men.

A great many men are employed about the several mines here, as well as about the two mills now going up. Masons and carpenters are still in demand, as well as wood choppers, timbermen, and coal burners.

Idaho.

From the Owyhee *Avalanche* of Oct. 12.

EMPIRE.—Upon visiting this mine this week we went through it from top to bottom, and were agreeably surprised to see it so well opened. The shaft is down 80 feet below the 2d level, showing all the way a splendid vein of ore from two to four feet in width. We understand that they intend to start the 3d level when the shaft is 90 feet deep. This will give a large amount of stoping ground, as the ledge is very large. The 2d level drift is in south of the shaft about 140 feet, and connects with a winze; the same level is in 120 feet north of the shaft. Stopes follow up these drifts both north and south. The first level drift north is being driven into the hill, where underhand stoping is going on at a rapid rate. The foreman, J. H. Thomas, thinks that by December 1st he will have room for 100 drillers. The ore-house is full to overflowing of ore that is now being hauled to the Cosmos mill. We noticed quite a number of small cabins, or sleeping houses in course of construction near the mine, which are not only desirable but will be very comfortable for the miners. Taken altogether, the Poorman side of War Eagle Mountain is looming up again like times of old.

MINNESOTA.—We took a look through the Minnesota a couple of days ago. This mine has taken quite a turn for the better of late. Whenever we see the men at work in a mine send orders below for stock, we conclude the mine must be looking well. This is the case with the Minnesota at present. We are informed that, during the past two weeks, orders have been sent off for over 4,000 shares of the stock, and much of it for miners working in the mine. They have had a fine ledge in the shaft for some time, but the best portion of the mine is south of the shaft 170 feet, between the 3d and 4th levels; and when the 4th level drift gets under it, we may expect to see the Minnesota ship a large amount of bullion. The shaft is down 60 feet for the 5th level. At a depth of 55 feet they came upon a slide or break in the ledge, which cut it almost entirely out, but the vein has come in again and is nearly two feet wide. Some very good ore is also found in the 3d level drift, 80 feet north of the shaft. The Cosmos mill is now running on the ore and we have no doubt but Bob Leonard will give the company good results.

PAUPER.—The management of this mine is now in the hands of C. H. Johnson, a gentleman of excellent business ability and extensive practical mining experience. The old whim is being replaced by a new one, and other preparations are going on so that the mine can be worked throughout the winter. As soon as the hoisting works are ready, the shaft will be put down, a new level opened up, and the mine thoroughly prospected. Judging from the appearence of a small lot of ore on the dump and from what we can learn of the size and character of the vein, we expect to see a valuable mine developed under the present management, and feel confident that the Company are fully justified in their expenditures on the mine. On account of the work now being done we could not go into the mine this week, but will do so at the earliest opportunity.

WAR EAGLE.—This mine is in full blast, and turning out, as usual, plenty of ore—from 20 to 25 tons per day, nearly all of which comes from the 3d level. The shaft is down for the 5th level, and drifts, both north and south, commenced. The vein in the shaft from the 4th to the 5th level, a distance of 100 feet, averages nearly 30 inches in width, which is a very favorable showing for the ground to be opened in the 5th level stopes. The winze, 80 feet south of the shaft, was sunk 80 feet and abandoned on account of water till connection can be made with the level. In the winze the vein averages over 4 feet in width throughout. There is upwards of 300 tons of ore at the mill which is paying about $30 per ton.

FLINT DISTRICT.—The Rising Star mine is worked rather slow, but apparently in a careful way. A portion of the force employed are prospecting all the time, by sinking and drifting, while others are kept taking out ore to keep up expenses, all of which is certainly a good way to prospect a mine. It is expected that the Company will place the hoisting works on the Boyd shaft and continue sinking. This shaft is now between 60 and 90 feet below the third level, following the incline of the ledge from the surface. They have now in the mill about 100 tons of very fine ore that will pay, say from $125 to $150 per ton. They have moved the boarding house to the mine, and Wm. Richards, the foreman, says everything is moving along nicely.

GOLDEN CHARIOT.—The 9th level south drift is in 20 feet, showing a two foot ledge of fair looking ore. The 8th and 9th level north drifts are in 75 and 40 feet respectively. The vein in the 5th level south is improving in appearane, and, in fact, the whole mine improves as they go south. A winze is being raised from the 5th to the 4th level south of the shaft, where the ore looks well. The 9th level stopes are also showing well. Superintendent Linkton informs us that he experiences great difficulty in working the mine on account of the scarcity of miners. He only has 14 men at work in the mine, whereas he should have 30 if he could get them. That excellent and go-ahead miner, Peter Nicholson, is now foreman of the Golden Chariot.

IDA ELLMORE.—This mine is looking well. First-class ore is being raised from the 8th level stopes, and the ledge looks splendidly in the winze that is being put down for the 9th level. The ore is being worked in the Company's mill, and, we are informed, is turning out very satisfactorily.

RED JACKET.—A run of 76 tons of Red Jacket ore, taken from various portions of the mine, has just been cleaned up at the Ellmore mill, yielding a fraction over $40 per ton. This we consider a handsome yield, and under what we believe Red Jacket will pay in the future.

NORTH STAR.—Leonard & Douglass are down some 20 feet on this new discovery on Florida Mountain. The vein is fully four feet wide, and, thus far, very rich in gold and silver. They have out between 20 and 30 tons of ore, and will soon have a crushing.

IDLEWILD.—Mr Thompson has just completed a dwelling house near the mine, and will immediately put up a shaft house, preparatory to winter working.

BULLION SHIPMENT.—Wells, Fargo & Co. shipped from here during the week ending yesterday, 5 bars of bullion, valued at $8,257 74.

MAHOGANY.—Owing to the bungled up state of affairs of this Company lately, we are not able to say anything about the mine this week.

ILLINOIS CENTRAL.—Have put up a shaft house, and are getting things ready for extensive work during the coming winter.

SOUTH CHARIOT.—The 4th level stopes are yielding high-grade ore, and the mine is improving generally.

MORNING STAR.—Still running night and day taking out ore for another crushing.

HOME INTEREST.—Taking out ore for another crushing. The last crushing paid $81 75 per ton.

BELLE PECK.—New shaft down 15 feet—still showing very rich ore.

RED MOUNTAIN.—Taking out splendid looking ore.

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SUPERIOR RAIL MILL.—CAPACITY: 1,000 TONS PER WEEK.

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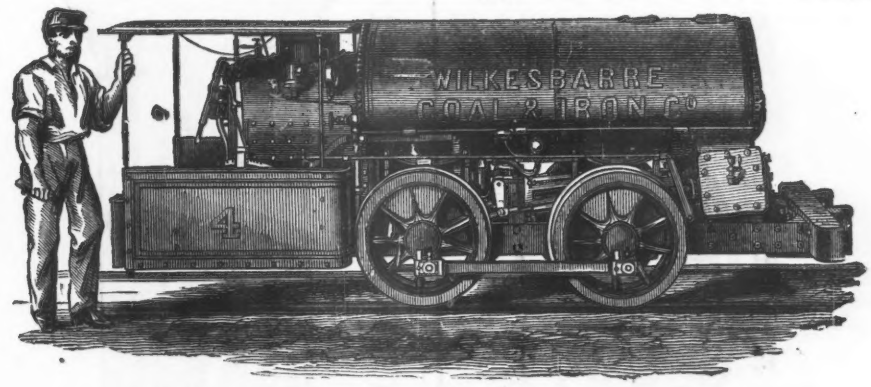

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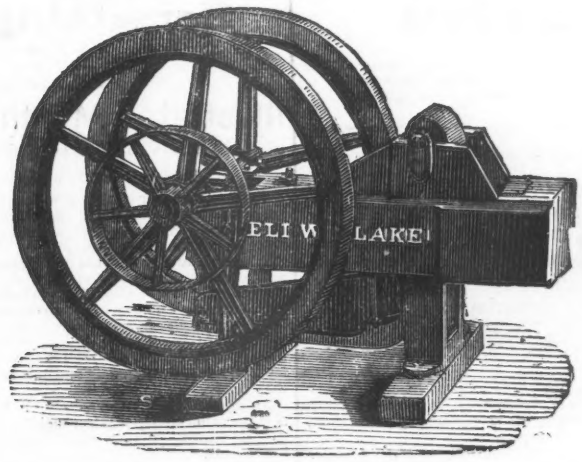

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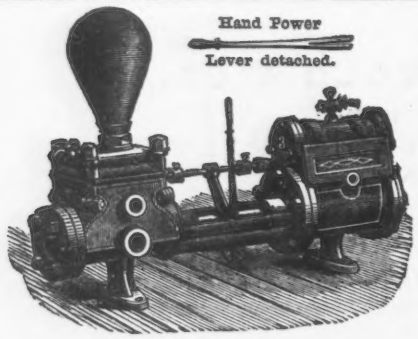

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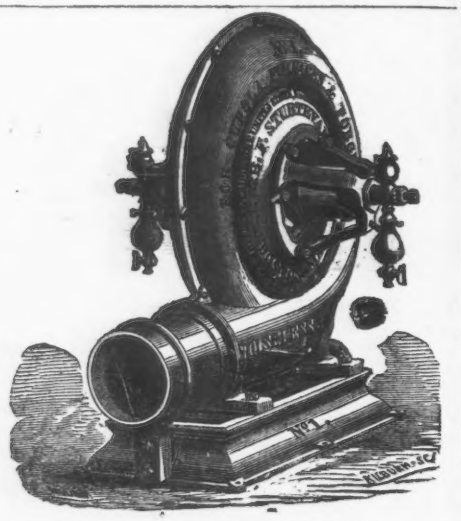

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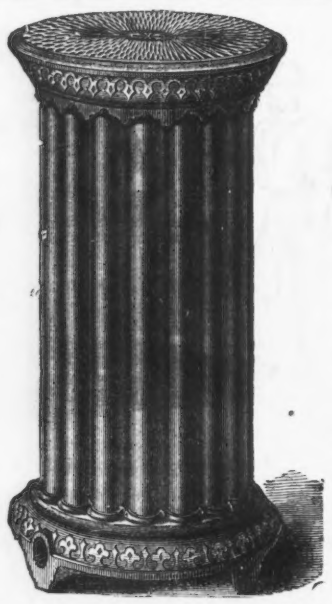

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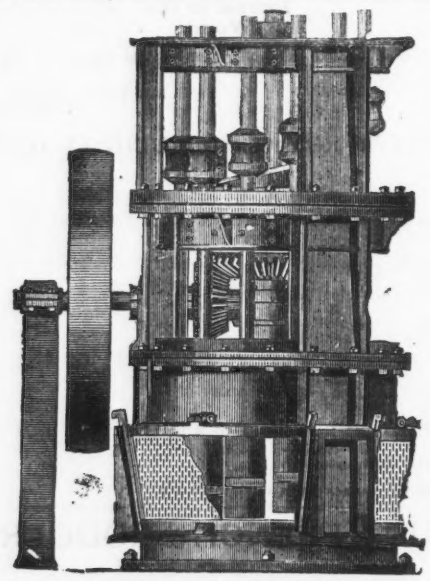

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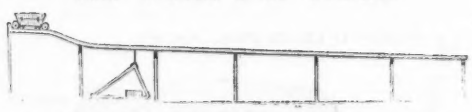

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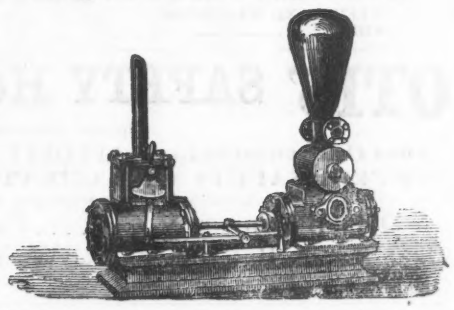

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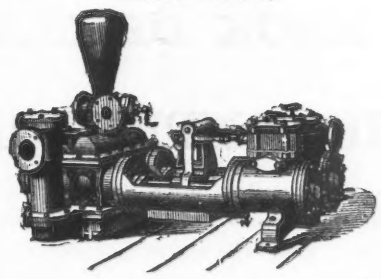

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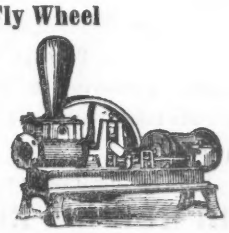

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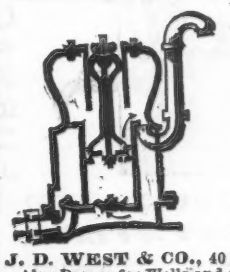

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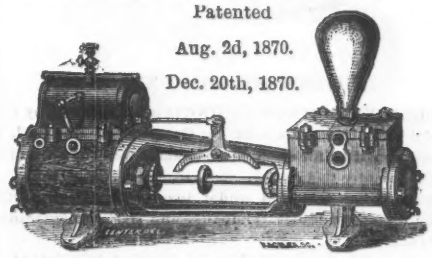

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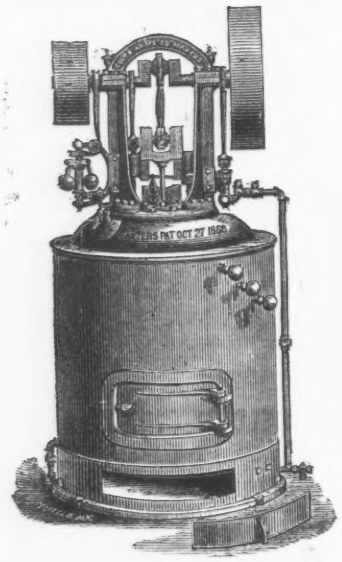

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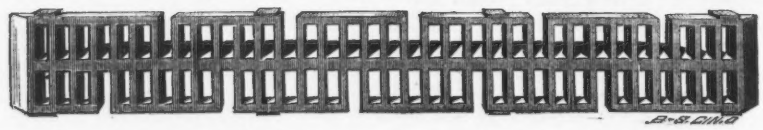

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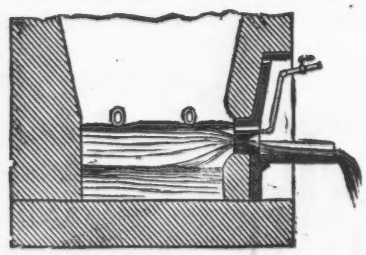

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